



त्रिभुवन विश्वविद्यालय
TRIBHUVAN UNIVERSITY
इन्जिनियरिङ्ग अध्ययन संस्थान
INSTITUTE OF ENGINEERING



परीक्षा नियन्त्रण महाशाखा
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फोन: ५२६०६३६, ५२६०७१६
फ्याक्स: ५२६०१२९

च.नं. २५८ ०८१/८२

मिति : २०८१/०५/२५

सूचना

इ.अ.सं. विद्यापरिषदको निर्णय अनुसार प्राप्त Detail Syllabus को अधिनमा रही यस महाशाखाद्वारा सञ्चालन गरिने स्नातक तह (BE/BAR) प्रथम वर्ष दौश्रो खण्ड (२०८० ब्याच) को नयाँ पाठ्यक्रम अनुसार नमूना प्रश्न पत्र तयार गरी शिक्षक तथा विद्यार्थीहरुको जानकारीको लागि प्रकाशित गरिएको छ ।

पुनश्च: प्रथम वर्ष प्रथम खण्डको विषयहरु सङ्ग मेल खाएका विषयहरुको नमूना प्रश्नपत्र मिति २०८०/०१/०७ मा प्रकाशित भै सकेको जानकारी गरिन्छ ।

सहायक डीन
परीक्षा

TRIBHUVAN UNIVERSITY
INSTITUTE OF ENGINEERING
Examination Control Division
(Sample Question)

Exam.	Regular (New Course)		
Level	BE	Full Marks	60
Programme	BME, BAS, BIE, BAM	Pass Marks	24
Year / Part	I/II	Time	3 hrs.

Subject: - Workshop Technology (ME 155)

- ✓ Candidates are required to give their answers in their own words as far as practicable.
 - ✓ Attempt **All** questions.
 - ✓ The figures in the margin indicate **Full Marks**.
 - ✓ Assume suitable data if necessary.
1. Define workshop safety. Explain the impact of workshop accidents on productivity of the plant. [3+3]
 2. Draw a neat sketch of hack-saw showing all the parts and discuss the cutting procedure using hack-saw. [6]
 3. List and describe any two tools used in Sheetmetal work with sketch. What are the key steps involved in riveting process? [2+4]
 4. Define chip compression ratio. Explain different types of chips formed in machining. [6]
 5. Draw a neat schematic sketch of shaper machine showing major parts and list the operations that could be performed in a shaper machine. [6]
 6. Discuss any three type of heat treatment process in workshop with their applications. [6]
 7. Explain the working of open die and closed die forging with neat sketch listing their applications. [6]
 8. With schematic diagram, explain the working and operation of any one inert gas welding in workshop. Write any two precautions to be followed during this process. [4+2]
 9. Write short note on “Application and significance of jigs and fixture in manufacturing industry.” [6]
 10. You are required to manufacture a cross peen hammer head in workshop. You can follow manufacturing process of your choice with justification. Discuss your machining plan in steps starting from preparing the job to finishing the job mentioning all the machines, operations, and safety and precautions involved in the plan. [6]

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(Sample Question)

Exam.	Regular (New Course)		
Level	BE	Full Marks	60
Programme	BAG	Pass Marks	24
Year / Part	I / II	Time	3 hrs.

Subject: - Soil Science (AE 152)

- ✓ Candidates are required to give their answers in their own words as far as practicable.
- ✓ Attempt **All** questions.
- ✓ The figures in the margin indicate **Full Marks**.
- ✓ Assume suitable data if necessary.

- 1 Define soil. What are the various concepts of soil in reference to agricultural activity? [6]
- 2 Illustrate morphological property of soil in brief. [6]
- 3 What is soil classification? Describe the soil taxonomical classification. [6]
- 4 Describe various physical properties of soil in brief. [6]
- 5 How does soil temperature plays a role for production of crop? [6]
- 6 Illustrate the cation and anion exchange phenomena of soil. [6]
- 7 Describe various types of nutrients which are involved for healthy production [6]
- 8 What do you mean by deficiency symptoms of nutrients? Describe deficiency symptoms of primary nutrients. [6]
- 9 Write Short notes on: [3*4]
 - a. Biological nitrogen fixation
 - b. Soil organic matter
 - c. Organic vs inorganic fertilizer
 - d. Bio fertilizer vs organic manure

TRIBHUVAN UNIVERSITY
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(Sample Question)

Exam.	Regular (New Course)		
Level	BE	Full Marks	60
Programme	BCH	Pass Marks	24
Year / Part	I / II	Time	3 hrs.

Subject: - Organic and Inorganic Chemistry (SH 154)

- ✓ Candidates are required to give their answers in their own words as far as practicable.
- ✓ Attempt **All** questions.
- ✓ The figures in the margin indicate **Full Marks**.
- ✓ Assume suitable data if necessary.

- 1 Outline the synthesis of 4-Methylpentanoic acid by malonic ester synthesis. [5]
- 2 What are heterocyclic organic compounds? Discuss the electrophilic substitution reactions of Pyridine. [1+4]
- 3 Draw molecular orbital energy level diagram of nitrogen molecule. What is its bond order? [4+1]
- 4 a) Most of the transition metal compounds are coloured. How does the crystal field theory explain color of complex compounds? [2+3]
b) Draw and explain the splitting of d-orbitals in tetrahedral field complexes. [5]
- 5 Discuss the preparation of organometallic compounds. [5]
- 6 What is meant by protic and aprotic solvents? Mention the importance of each. [3+2]
- 7 What are detergents? Describe the synthesis of sulphuric acid by contact process. [1+4]
- 8 a) What are monosaccharides? Discuss Ruff degradation synthesis. [1+4]
b) What is fat chemically? Briefly discuss alkaline hydrolysis of fat in and its applications. [2+3]
- 9 How does a peptide differ from a Protein? Outline the synthesis of a dipeptide; Glycylalanine, (Gly-Ala), by benzyloxycarbonyl method. [1+4]
- 10 Briefly explain gene cloning and its scope in molecular genetics. [5]

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Sample Question

Exam.	Regular (New Course)		
Level	BE	Full Marks	60
Programme	BCT, BEI	Pass Marks	24
Year / Part	I / II	Time	3 hrs.

Subject: - Object Oriented Programming (CT 151)

- ✓ Candidates are required to give their answers in their own words as far as practicable.
- ✓ Attempt **All** questions.
- ✓ The figures in the margin indicate **Full Marks**.
- ✓ Assume suitable data if necessary.

1. In OOP, how may complexity be handled by abstraction? Give an example to illustrate. [2+2]
2. Define reference variable. Explain inline function with suitable example. Write a suitable program to show the concept of pass by reference and return by reference. [1+3+3]
3. Explain relation between constant object and constant member functions of a class. When is necessary to make static member data and member functions in a class? Explain with example. [4+5]
4. What are the rules of operator overloading? Write a program to read a height of a person in Feet and Inches and convert it into Meter using class type to class type conversion method. (1 meter= 3.28084 feet, 1 feet=12 inch.) [2+5]
5. Discuss various access specifier in case of inheritance. Imagine that a college hires lecturer. Some lecturers are paid in period basis, while others are paid in monthly basis. Create a class called lecturer that stores ID, and the name of the lecturers. From this class derive two classes part-time which adds pay_per_hr and fulltime which adds pay_per_month. Each of these three classes should have function readdata() to get its data from the user's keyword and display the data with printdata(). Write a program to create object of class fulltime and parttime and member function to read and display data. [3+4]
6. Why do we need virtual function in C++? How is typeid used to achieve RTTI? [3+2]
7. What are standard manipulators? Write a class student with roll, name, address, marks as member variables. Use a member function to write record of students in a binary file and another member function to read records from file. Write a program to search a specific record of student using roll number as key from user input. [2+6]
8. How can you achieve the generic programming in C++? Write a function templates to calculate the average and multiplication of numbers. [2+6]
9. What is the need of exception handling in C++? Write a program to demonstrate exception handling with "catch all" block. [2+3]

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Sample Question

Exam.	Regular (New Course)		
Level	BE	Full Marks	60
Programme	BAR	Pass Marks	24
Year / Part	I / II	Time	3 hrs.

Subject: - Mathematics for Architecture –II (SH 155)

- ✓ Candidates are required to answer as their one word as far as possible.
- ✓ Attempt **All** questions.
- ✓ The figures in the margin indicate **Full Marks**.
- ✓ Assume suitable data if necessary.

- 1 (a) Find the volume of the parallelepiped whose edges are represented by

[3x2]

$$\vec{a} = 2\vec{i} - 3\vec{j} + 4\vec{k}, \vec{b} = \vec{i} + 2\vec{j} - \vec{k} \text{ and } \vec{c} = 3\vec{i} - \vec{j} + 2\vec{k}$$

- (b) A particle moves along the curve $x = 4\cos t, y = t^2, z = 2t$. Find the velocity and acceleration of the particle at the time $t = 0$

(c) Evaluate: $\int_1^2 \left(\vec{r} \cdot \frac{d\vec{r}}{dt} \right) dt$ where $\vec{r} = 5t^2\vec{i} + t\vec{j} - t^3\vec{k}$

- 2 (a) Determine whether the following vectors are linearly dependent or independent $(3, 1, -2), (2, 2, -3), (0, -4, 1)$.

[3x2]

(b) Find the rank of the matrix $\begin{bmatrix} 1 & 2 & 0 & -1 \\ 3 & -1 & 1 & 2 \\ -2 & 3 & 2 & 5 \end{bmatrix}$.

- (c) Verify Cayley Hamilton Theorem for $A = \begin{bmatrix} 5 & 4 \\ 1 & 2 \end{bmatrix}$, and hence find its inverse.

[3x2]

- 3 (a) The numbers 3.2, 5.8, 7.9 and 4.5 have frequencies $x, (x + 2), (x - 3)$ and $(x + 6)$ respectively. If the arithmetic mean is 4.876, find the value of x .

- (b) The difference between the upper quartile and lower quartile of a certain frequency distribution is 4 and their sum is 16. Calculate quartile deviation and its coefficient.

- (c) If $n = 50, \sum X = 75, \sum Y = 80, \sum X^2 = 130, \sum Y^2 = 140, \sum XY = 120$, find the co-efficient of correlation.

[3x2]

- 4 (a) A die is tossed twice getting an odd number is termed as success. Find the probability distribution of the number of successes.

- (b) Between the hours 2 P.M. and 4 P.M. The average number of phone calls per minute coming into a switch board of a company is 2.35. Find the probability that one particular minute, there will be at most two phone calls.

- (c) If $P(A) = 0.40, P(B) = 0.32$ and $P(B/A) = 0.5$, find $P(A/B)$

(5) Find the angle between the surface $x^3 + y^3 + z^3 = 9$ and $z = x^2 + y^2 - 3$ at the point (2, -1, 2) [4]

(6) Prove that the necessary and sufficient condition for the vector function of a scalar variable 't' have constant magnitude is $\vec{a} \cdot \frac{d\vec{a}}{dt} = 0$ [4]

(7) Find the Eigen values and corresponding Eigen vectors of the matrix $A = \begin{bmatrix} 2 & 0 & 1 \\ 0 & 2 & -1 \\ 0 & 0 & 2 \end{bmatrix}$ [4]

(8) Test the consistency of the system $x + y + z = 3, x + 2y + 3z = 4, 2x + 3y + 4z = 7$ and solve if consistent. [4]

[10] Find Karl Pearson's coefficient of skewness for the following distribution. [4]

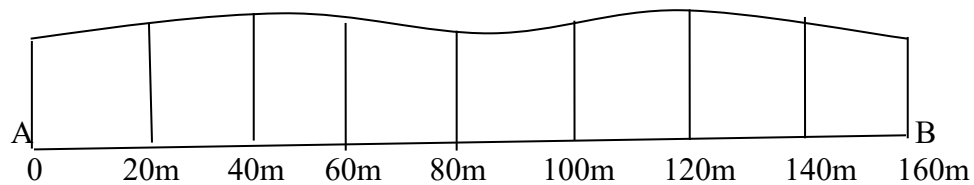
Wages more than (in Rs)	5	15	25	35	45	55	65
Number of earners	100	80	75	60	55	20	0

[11] Suppose that a Central University has to form a committee of 5 members from a list of 20 candidates out of whom 12 are teachers and 8 are students. If the members of committee are selected at random, what is the probability that the majority of committee members are students?

[12] The average number of collisions occurs during the summer months at particular intersection is 2 per week. [4]

- What is the probability of no collisions in any particular week?
- What is the probability that there will be exactly one collision in a week?
- what is the probability of at most two collisions in a week?

[13] Using Simpson's rule determine the area between the straight-line AB and the undulating line where in offsets are taken at regular interval of 20 m along the AB. [4]



Point	A								B
Distance	0	20	40	60	80	100	120	140	160
Offset length(m)	16.3	18.8	17.1	15.2	19.8	18.1	19.2	17.7	15.3

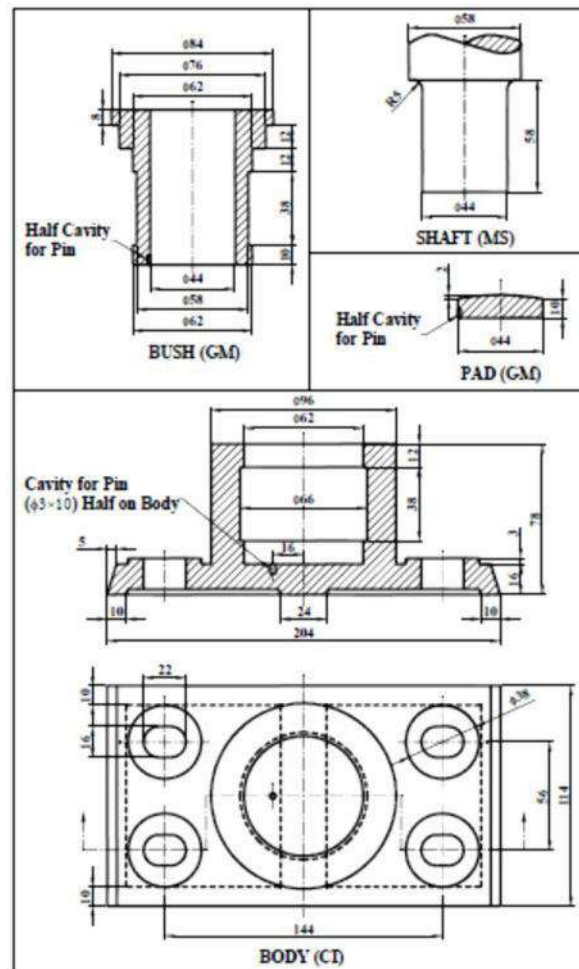
TRIBHUVAN UNIVERSITY
INSTITUTE OF ENGINEERING
Examination Control Division
(Sample Question)

Exam.	Regular (New Course)		
Level	BE	Full Marks	40
Programme	BME, BAM, BIE, BAS	Pass Marks	16
Year / Part	I / II	Time	3 hrs.

Subject: - Machine Drawing (ME 152)

- ✓ Candidates are required to give their answers in their own words as far as practicable.
- ✓ Attempt **All** questions.
- ✓ The figures in the margin indicate **Full Marks**.
- ✓ Assume suitable data if necessary.

1. Determine the limits and fits for a pair of diameter designed by 12H7/e8. Take diameter steps; 6-10, 10-18, 18-30. Standard tolerance unit (i) for IT7 and IT8 are 16i and 25i, respectively. Fundamental deviation for e shaft = $-11D^{0.41}$, D is geometric mean diameter. [6]
2. Draw three orthographic views of a nuts and bolt with the given specification: Hex.M16 X3X40/60 where the symbols have usual meaning. [6]
3. Sketch the plan and sectional elevation of the single riveted double strap chain type butt joint. Take the diameter of the rivet 18 mm. [6]
4. Draw a piping layout using single-line symbols to represent a pipe system with a cap, a tee, a reducer, an elbow, a ball valve, plug, and a pressure gauge. [6]
5. Draw the front view with section and top view of the assembly with part list. [16]



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Sample Question

Exam.	Regular (New Course)		
Level	BE	Full Marks	60
Programme	BAR	Pass Marks	24
Year / Part	I /II	Time	3 hrs.

Subject: - History of Nepalese Architecture (AR 154)

- ✓ Candidates are required to give their answers in their own words as far as practicable.
- ✓ Attempt **All** questions.
- ✓ The figures in the margin indicate **Full Marks**.
- ✓ Make sketches to illustrate your answer where appropriate.

- 1 In terms of layout, design, and construction materials, list and describe the key characteristics of the Lichchhavi palaces. [12]
- 2 Using the appropriate sketches, discuss the architecture of a tiered temple from Malla period, taking into accounts its concept, ritual requirements, and symbolism. [12]
- 3 Using the required sketches, compare and contrast the Bahal with the Bahil in terms of form, design, and functionality. [12]
- 4 Describe how the Kathmandu valley's climate, materials, and technological advancements have shaped Malla architecture. [12]
- 5 Write short notes on any three of the following topics; [3*4]
 - a. Kirat settlements
 - b. Dharahara
 - c. Marpha house
 - d. Ramgramn stupa

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Examination Control Division
(Sample Question)

Exam.	Regular (New Course)		
Level	BE	Full Marks	60
Programme	BGE	Pass Marks	24
Year / Part	I / II	Time	3 hrs.

Subject: - Fundamental of Civil Engineering (CE 157)

- ✓ Candidates are required to give their answers in their own words as far as practicable.
- ✓ Attempt **All** questions.
- ✓ The figures in the margin indicate **Full Marks**.
- ✓ Assume suitable data if necessary.

- 1 Differentiate between elevation and sections of a building. [4]
- 2 What preventive measures, rehabilitation and rescue program could you have undertaken in the recent avalanche in the Thasang Rural Municipality in Mustang? [8]
- 3 Calculate the design discharge for a sewer from the following data; projected population= 7000, area =8 Km², permeability factor is 70%, rainfall duration is 15 minutes, time of flow is 15 minutes and time of entry is 5 minutes. Assume that 75% of applied water is converted as waste water and maximum demand is three times average demand. [8]
- 4 What are the different types of head loss in channel flow? [8]
- 5 Explain hydrological cycle with all components. [4]
- 6 Why do we need a planned irrigation system in Nepal? [4]
- 7 Mention types of hydropower in Nepal based on installation capacity and storage. [4]
- 8 How will you address the parking issue in pokhara valley? Explain in terms of parking space management. [4]
- 9 Explain the criteria for selection of Location of EV Charging Stations. [4]
- 10 Workout quantity of dry material for plastering work in cement- mortar (1:3). Thickness of plaster is 12.5mm and area of wall is 200 m². [4]
- 11 What are the steps for cost estimating a highway project? [4]
- 12 Explain project scheduling and mention the various ways of project scheduling considered in practice. [4]

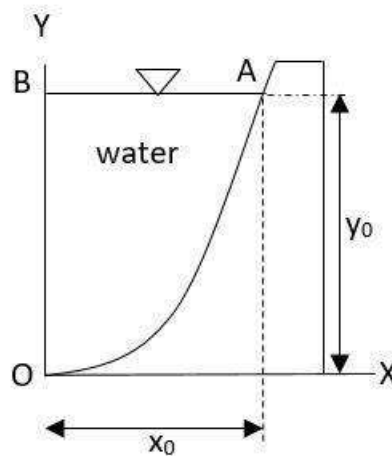
TRIBHUVAN UNIVERSITY
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(Sample Question)

Exam.	Regular (New Course)		
Level	BE	Full Marks	60
Programme	BAG	Pass Marks	24
Year / Part	I / II	Time	3 hrs.

Subject: - Fluid Mechanics (CE 155)

- ✓ Candidates are required to give their answers in their own words as far as practicable.
- ✓ Attempt **All** questions.
- ✓ The figures in the margin indicate **Full Marks**.
- ✓ Assume suitable data if necessary.

1. a) Explain isothermal and adiabatic compressibility showing their relationship. [3]
- b) The pressure between two points A and B in a pipe conveying oil of specific gravity 0.8 is measured by an inverted U-tube. The column connected to point B stands 1.6 m higher than at point A. A commercial pressure gauge attached directly to the pipe at A reads 1.125 kg (f)/cm², determine its reading when attached directly to the pipe at B. [5]
2. a) A dam has a parabolic shape $y = y_0\left(\frac{x}{x_0}\right)^2$, having $x_0 = 4$ m and $y_0 = 8$ m . The fluid is water with density = 1000 kg/m³. Compute the horizontal, vertical and the resultant thrust exerted by water on 5 m length of the dam. [8]



- b) A wooden cylinder of diameter d and length $2d$ floats in water with its axis vertical. Is the equilibrium stable? Locate the metacenter with reference to water surface. Specific gravity of wood is 0.6. [6]
3. In a two-dimensional incompressible flow, the fluid velocity components are given by:
 $u = x - 4y$ and $v = -y - 4x$
4. Show that velocity potential exists and determine its form. Find also the stream function. [6]
5. In the fig., the fluid is water and the gauge pressure at point 1 is 180Kpa. If the mass flux is 15kg/s, what is the head loss between 1 and 2? (flux = flow rate). [6]

6. a) 250 Litres/s of water is flowing in a pipe having a diameter of 300 mm. If the pipe is bent by 135° , find the magnitude and direction of the resultant force on the bend. The pressure of water flowing is 39.24 N/cm^2 . [6]
- b) Derive force exerted by jet on inclined stationary plate. [4]
7. A 2.5 m ship model was tested in fresh water with density $\rho = 1000 \text{ kg/m}^3$ and measurement indicated that there was a resistance of 45N when the model was moved at 2 m/sec. For 40 m long prototype, calculate the force required to drive the prototype and velocity in the prototype, considering the density of sea water as 1025 kg/m^3 . [6]
8. a) If the velocity profile in a laminar boundary layer is approximated by a parabolic profile as: $\frac{u}{U} = \frac{3}{2}\left(\frac{y}{\delta}\right) - \frac{1}{2}\left(\frac{y}{\delta}\right)^2$. Where u is the velocity at depth y, δ is the boundary layer when u tends to free stream velocity U. Calculate the displacement and momentum thickness. [6]
- b) A kite weighing 12.26 N has an effective area of 0.9 m^2 . The tension in the kite string is 32.37 N when the string makes an angle of 45° with the horizontal. For a wind of 32 km/hr, what are the coefficients of lift and drag if the kite assumes an angle of 8° with the horizontal? Take specific weight of air as 11.801 kg/m^3 . [4]

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(Sample Question)

Exam.	Regular (New Course)		
Level	BE	Full Marks	60
Programme	BCE	Pass Marks	24
Year / Part	I / II	Time	3 hrs.

Subject: - Engineering Survey I (CE 153)

- ✓ Candidates are required to give their answers in their own words as far as practicable.
- ✓ Attempt **All** questions.
- ✓ The figures in the margin indicate **Full Marks**.
- ✓ Assume suitable data if necessary.

1. a) Enlist some of the important uses of surveying. In short explain the secondary classification of surveying [2+2]
 - b) Explain in brief different types of sources of error with examples. Explain about direct and indirect ranging. [2+2]
 - c) The plan of an area has shrunk such that a line originally 10 cm is now measures 9.9 cm. If the original scale of the plan was 1:1000, determine:
 - i) Shrinkage factor
 - ii) Shrunken Scale
 - iii) Correct distance corresponding to a measured distance of 95 m.
 - iv) Correct area corresponding to a measured area of 9000 sq. m. [4]
2. a) Draw a neat sketch of double line field book showing detailing using both oblique and perpendicular offsets. How do you carry out orientation by back sighting? [2+2]
 - b) How the correction of angular misclosure in link traverse is done. Elaborate with an example. [2]
 - c) The following bearings were observed where local attraction was suspected. Calculate the correct bearings of the lines using bearing correction method and the internal angles using those bearings. [6]

Line	FB	BB
AB	S 40°30' W	N 41°15' E
BC	S 80°45' W	N 79°30' E
CD	N 19°30' E	S 20°00' W
DA	S 80°00' E	N 80°00' W

3. a) Explain the fundamental and working principle of levelling. Why sight balance is necessary? [3+1]
 - b) List and explain any two levelling operations. [1+2]
 - c) The following successive readings were taken with a dumpy level along a chain line at common intervals of 20m. The first reading was taken on a chainage 160m. The RL of the second change point was 1246.451m. The instrument was shifted after the third and eight readings. Calculate the RLs of all the points and gradient between A and B.
3.150(A), 2.245, 1.125, 3.860, 2.125, 1.325, 0.760, 0.470, 2.235, 1.736, 3.225 and 3.920(B) m. [5]
4. a) What are the principle of actual operation of EDM? Write about the uses of total station. [4]
 - b) What is subtense bar method of tacheometry? Explain with neat sketch. [3]

- c) During the survey of suspension bridge the following observation were made in triangle ABC. AB is the bridge axis. The least count of instrument is 1'00".

Instrument Station	Target Station	HCR observation	
		Direct Face	Reversed Face
A	B	00°00'00"	180°00'20"
	C	54°38'20"	234°38'00"
B	C	00°00'00"	180°00'10"
	A	89°20'20"	269°20'40"
C	A	00°00'00"	180°00'20"
	B	36°00'20"	215°59'40"

Compute the angle and correct them if necessary. If the length of line BC is 65.232m, find the span of bridge axis AB. [5]

5. a) Describe the principle trilateration. List the specifications used in trilateration. [2+2]
 b) Explain the procedure to plotting of profile levelling by appropriate CAD software. [4]
 c) The following tachometric observations were made with an Anallatic telescope having a multiplicative constant of 100 on a vertically held staff.

Inst. Station	H.I.	Staff Station	Vertical angle	Stadia readings(m)		
A	1.480	B.M.	- 1°54'	1.020	1.720	2.420
A	1.480	P	+2°36'	1.220	1.825	2.430
Q	1.500	P	+3°06'	0.785	1.610	2.435

If the R.L. of Benchmark is 2024.000 m, find the R.Ls of the stations A, P, and Q. Also, find the distance between BM and A, A and P, &P and Q. [4]

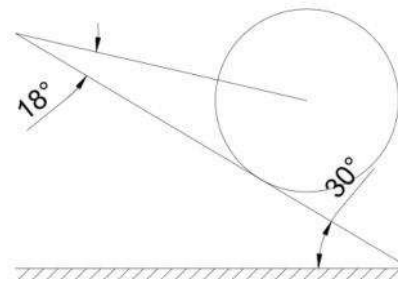
TRIBHUVAN UNIVERSITY
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Level	BE	Full Marks	60
Programme	BCH/BGE	Pass Marks	24
Year / Part	I / II	Time	3 hrs.

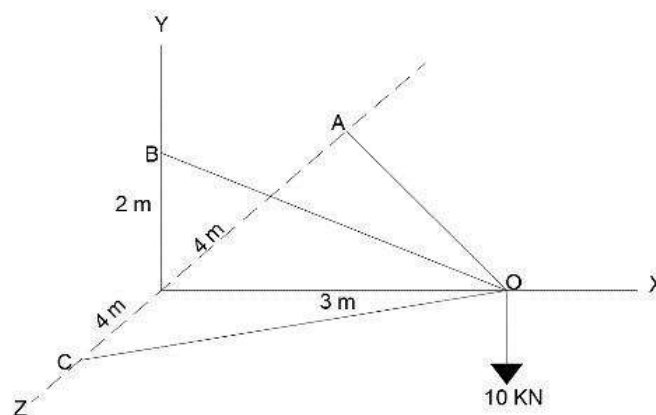
Subject: - Engineering Mechanics (CE 154)

- ✓ Candidates are required to give their answers in their own words as far as practicable.
- ✓ Attempt **All** questions.
- ✓ The figures in the margin indicate **Full Marks**.
- ✓ Assume suitable data if necessary.

- 1 a). A Roller having weight 500N and radius 30 cm rests on a smooth inclined plane and is kept free from rolling down by a string as shown in figure. Calculate the force developed in the string and reaction at the point of contact. Explain about the concept of a particle and a rigid body. [3+2]

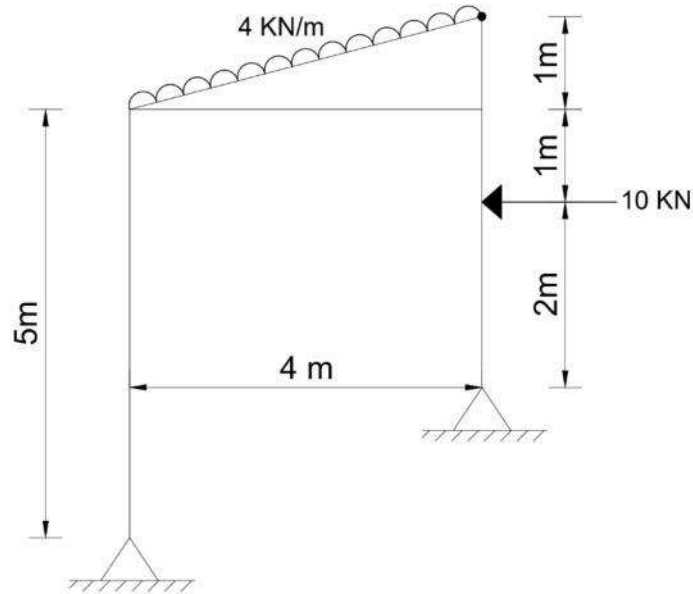


- b) Define a wrench with example. How can we convert a force into a force and a couple? [1+2+5]
Explain with suitable diagram. A space truss is formed by three members OA, OB and OC as shown in figure. A weight of 10 kN has been suspended at joint O. Calculate the force developed in each member.

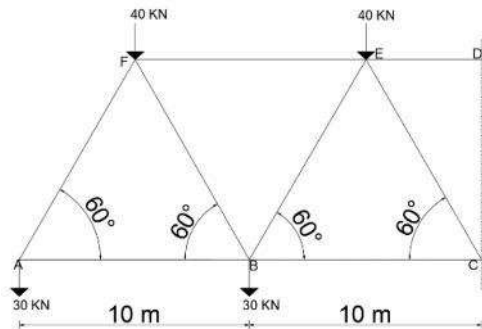


- 2 a). Define the terms static and dynamic coefficient of friction. Also explain about limiting angle of static friction with proper diagram. [2+2]

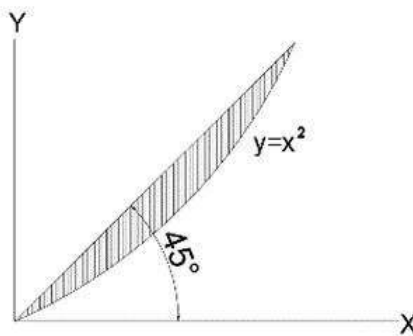
b). Deduce the relationship between load, shear force and bending moment for a beam section loaded uniformly with intensity of load w . Draw Axial Force, Shear Force and Bending Moment Diagram for the given frame loaded as shown in figure. Indicate the salient features if any. Note that here is an internal hinge at right-top corner of it. [2+12]



3 a). How can we check the determinacy and stability of structures (beam, frame and truss)? Define a truss and Determine the force in BF, BE, and FE members of the truss shown in figure below. [3+4]



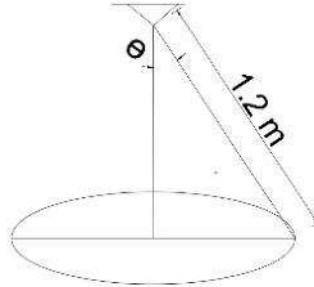
b). Define Radius of gyration. Determine the Moment of Inertia for the given shaded area about its centroidal X-X axis. [1+5]



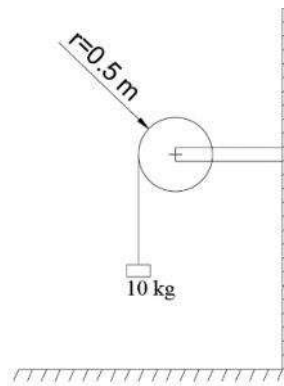
4 a). What do you mean by dependent motion of particle? Explain with suitable example. [2+1+2]
 Define curvilinear motion of particle. Show that the motion of projectile is combination of uniform rectilinear and uniformly accelerated rectilinear motion.

[2+3]

b). Explain different types of impact with example. The 10 Kg ball shown in figure revolves in a horizontal circle as shown. Determine the maximum possible value of θ and the corresponding value of the speed of the ball, if the tension in the cord is 250N.



c). Explain about the general plane motion of the rigid body with suitable example. [2+4]
 The 10 Kg block shown in figure hangs from the end of a cable wrapped around the uniform cylinder drum as shown. The system starts from rest when the block is at 1.25m above the floor. Determine the mass of the drum which will cause the block to hit the floor at two third the speed it would have, if it was simply dropped from the same height.

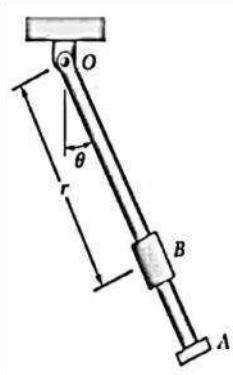


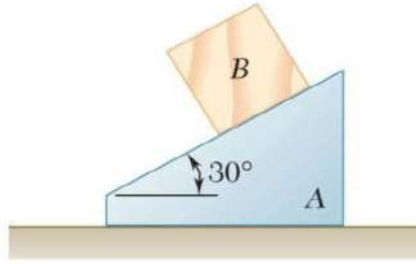
TRIBHUVAN UNIVERSITY
INSTITUTE OF ENGINEERING
Examination Control Division
(Sample Question)

Exam.	Regular (New Course)		
Level	BE	Full Marks	60
Programme	BME/BAM/ BAS/BIE	Pass Marks	24
Year / Part	I / II	Time	3 hrs.

Subject: - Engineering Mechanics II (ME 153)

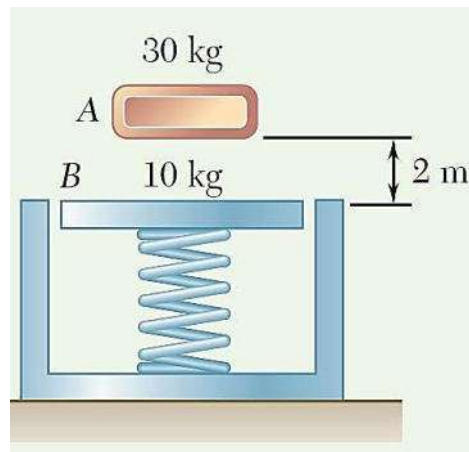
- ✓ Candidates are required to give their answers in their own words as far as practicable.
- ✓ Attempt **All** questions.
- ✓ The figures in the margin indicate **Full Marks**.
- ✓ Assume suitable data if necessary.

Q N	Questions (Model)	Marks
1.	<p>Differentiate the concept of statics and dynamics in engineering mechanics. The acceleration of a particle is defined by the relation $a = -(0.1 + \sin x/b)$, where a and x are expressed in m/s^2 and m, respectively. For $b = 0.8$ m and $v = 1$ m/s when $x = 0$, determine a) the velocity of particle when $x = -1$ m, b) the position where the velocity is maximum, and c) the maximum velocity.</p> <div style="text-align: center;">  </div>	[2+6]
2.	Derive the equation of path of projectile motion fired from ground.	[5]
3.	The 6-kg block B starts from rest and slides on the 15-kg wedge A, which is supported by a horizontal surface. Neglecting friction, determine (a) the acceleration of the wedge, and (b) the acceleration of the block relative to the wedge.	[8]

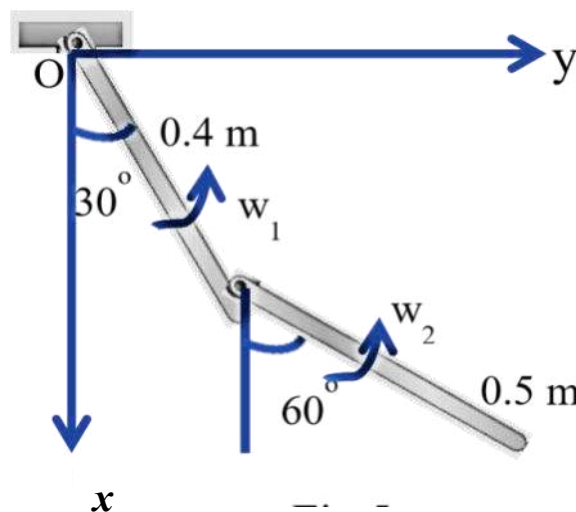


4. Define conservative and non-conservative forces with example. [3]

5. A 30-kg block is dropped from a height of 2 m onto the 10-kg pan of a spring scale. The constant of the spring is $k = 20 \text{ kN/m}$. Assuming the impact to be perfectly plastic, determine the maximum deflection of the pan. [7]

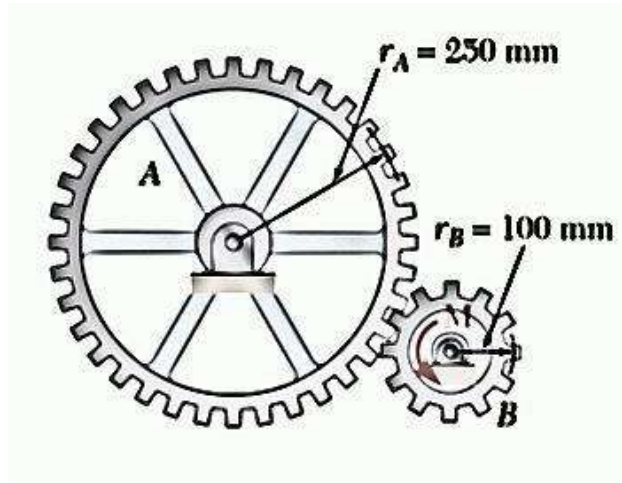


6. A double pendulum oscillates in the xy plane. At the instant shown in Figure, the angular velocities are $\omega_1 = 3 \text{ rad/s}$ and $\omega_2 = 4 \text{ rad/s}$ counter-clockwise. Determine the angular momentum about point O if $m_1 = m_2 = 1 \text{ kg}$. Note that the lower pendulum is connected to mass m_1 by a pin joint and is free to rotate about this point. [8]



7.	<p>The double gear rolls on the stationary lower rack: the velocity of its center is 1.2 m/s. Determine.</p> <p>a) the angular velocity of the gear,</p> <p>b) the velocities of the upper rack R and point D of the gear.</p>	[3+3]
8.	<p>A force P of magnitude 4 N is applied to a tape wrapped around a thin hoop of mass 2.5 kg. For the body rest on a frictionless horizontal surface as shown in figure , determine the acceleration of a) point A, b) point B.</p>	[5]
9.	<p>Discuss the differences between the eccentric impact with oblique impact.</p>	[3]
10.	<p>Gear A has a mass of 10 kg and a radius of gyration of 200 mm; gear B has a mass of 3 kg and a radius of gyration of 80 mm. The system is at rest when a couple M of magnitude 6 Nm is applied to gear B. Neglecting friction, determine (a) the</p>	[7]

number of revolutions executed by gear B before its angular velocity reaches 600 rpm, (b) the tangential force that gear B exerts on gear A.



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Examination Control Division
(Sample Question)

Exam.	Regular (New Course)		
Level	BE	Full Marks	30
Programme	BAG	Pass Marks	12
Year / Part	I / II	Time	hrs.

Subject: - Engineering Material (AE 151)

- ✓ Candidates are required to give their answers in their own words as far as practicable.
- ✓ Attempt **All** questions.
- ✓ The figures in the margin indicate **Full Marks**.
- ✓ Assume suitable data if necessary.

- 1 Write down the importance of engineering material in field of Agricultural Engineering. [2]
- 2 Define Timber. Discuss the various market of wood based products with neat sketches. [1+2+1]
Write down the uses of timber.
- 3 Classify bricks. Write down the qualities of good bricks. Discuss the harmful constituents of brick earth in brief. [2+2]
- 4 Enumerate the properties and uses of wrought iron. Explain steel alloys and their functions [2+2]
- 5 List out the purpose of Heat treatment of steel. Explain heat treatment methods of steel in brief. [1+4]
- 6 Write down the comparison between asphalt, bitumen and tar. [3]
- 7 Write down the ingredients of cement along with their functions. Mention the uses of lime in construction work. [4+1]
- 8 Write short notes on: (Any two) [2*1.5]
 - a. Belting Materials
 - b. Ordinary Portland Cement
 - c. Functions of paint
 - d. Lubricants
 - e. Types of synthetic polymer

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Examination Control Division
(Sample Question)

Exam.	Regular (New Course)		
Level	BE	Full Marks	30
Programme	BCE	Pass Marks	12
Year / Part	I / II	Time	1½ hrs.

Subject: - Engineering Geology II (CE 152)

- ✓ Candidates are required to give their answers in their own words as far as practicable.
- ✓ Attempt **All** questions.
- ✓ The figures in the margin indicate **Full Marks**.
- ✓ Assume suitable data if necessary.

- 1 Write the difference between deep and shallow groundwater circulation. [2]
- 2 Discuss the importance of point load test and flat-jack test in rock engineering. [4]
- 3 What is rock mass rating? Discuss the different parameters of geological strength index (GSI). [1+3]
- 4 Define geological hazard. Explain the effect of geological hazard on the development of earth surface. [5]
- 5 (a) What is geophysical investigation? What are the types of geophysical investigation? Discuss their application in engineering. [2+3]
(b) Four boreholes P, Q, R proposed at the corner of the square land. The sides of the square land are 520 m. The bore hole P is west of Q and S is north of Q. A quartzite bed is encountered at 160 m depth at P, 60 m depth at Q and 240 m depth at S. Determine the attitude of the quartzite bed. [5]
- 6 Conduct a stability analysis and suggest the possible mode of failure for given data: [5]

Cutslope (CS): $250^{\circ}/50^{\circ}$

Bedding (B): $234^{\circ}/40^{\circ}$

Joint (J): $10^{\circ}/60^{\circ}$

Friction angle (ϕ): 20°

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Examination Control Division
(Sample Question)

Exam.	Regular (New Course)		
Level	BE	Full Marks	60
Programme	All Except BAR	Pass Marks	24
Year / Part	I / II	Time	3 hrs.

Subject: - Engineering Mathematics II (SH 151)

- ✓ Candidates are required to give their answers in their own words as far as practicable.
- ✓ Attempt **All** questions.
- ✓ The figures in the margin indicate **Full Marks**.
- ✓ Assume suitable data if necessary.

1 (a) $\log(x^3 + y^3 - x^2y - xy^2)$, then show that $\left(\frac{\partial}{\partial x} + \frac{\partial}{\partial y}\right)^2 u = -\frac{4}{(x+y)^2}$ [2]

(b) If $u = \sin^{-1}\left(\frac{x+y}{\sqrt{x}+\sqrt{y}}\right)$, then show that $x\frac{\partial u}{\partial x} + y\frac{\partial u}{\partial y} = \frac{1}{2}\tan u$ [2]

2 (a) Evaluate $\int_0^\pi \int_0^x \sin y \, dx \, dy$ [2]

(b) Evaluate $\iiint_V xyz \, dx \, dy \, dz$ over the sphere $x^2 + y^2 + z^2 = a^2$ in first octant [2]

3 (a) A particle moves along the curve $x = 4 \cos t$, $y = 4 \sin t$, $z = 6t$, then find the velocity and acceleration at time $t = \frac{\pi}{2}$ [2]

(b) Find the unit normal vector to the surface $xy^3z^2 = 4$, at the point $(-1, -1, 2)$ [2]

(c) If $\phi = x^3 + y^3 + z^3 - 3xyz$, then show that $\text{curl}(\text{grad } \phi) = 0$ [2]

4 (a) Find the Laplace Transform of the function: $\frac{\sin^2 t}{t}$ [2]

(b) Find the inverse Laplace transform of $\frac{s^2+s-2}{s(s+3)(s-2)}$ [2]

5 (a) Find the rank of the following matrix: [2]

$$\begin{bmatrix} 1 & 2 & 0 & -1 \\ 3 & 4 & 1 & 2 \\ -2 & 3 & 2 & 5 \end{bmatrix}$$

(b) Test whether the vectors $(1,2,-1)$, $(1,2,4)$ and $(3,0,1)$ are linearly independent or dependent. [2]

6 Solve $y^2 + y = 0$, by power series method. [2]

7 Find the minimum value using Lagrange multiplier method of $x^2 + y^2 + z^2$ subject to the condition $ax + by + cz = p$. [4]

8 Change the order of integration and evaluate $\int_0^1 \int_x^{\sqrt{2x-x^2}} \frac{x}{\sqrt{(x^2+y^2)}} \, dx \, dy$ [4]

9 Prove that “A line integral $\int_C \vec{F} \cdot d\vec{r}$ is independent of path C joining any two points A and B if and only if $\vec{F} = \nabla\phi$ for some scalar function ϕ ” [4]

10 Using Green’s theorem, evaluate the line integral $\int_C (3x^2 - 8y^2)dx + (4y - 6xy)dy$ where C is the boundary of the region $y = \sqrt{x}$ and $y = x^2$ [4]

11 Using Gauss divergence theorem to evaluate the surface integral $\int \int_S \vec{F} \cdot \vec{n} ds$ for $\vec{F} = xy\vec{i} - xz^2\vec{j} + yz\vec{k}$ where S is the surfaces $x + y + z = 1, x = 0, y = 0, z = 0$ [4]

12 Using the Laplace transform technique, solve the initial value problem: [4]

$$y''(t) + 4y'(t) + 3y(t) = e^{-t}, \quad y(0) = 0, y'(0) = 1$$

13 Find the eigen values and eigen vectors of the Matrix $\begin{bmatrix} 6 & -2 & 2 \\ -2 & 3 & -1 \\ 2 & -1 & 3 \end{bmatrix}$ [4]

14 Reduce the quadratic form $Q(x) = 2x_1^2 + x_2^2 + 2x_3^2 + 2x_1x_2 + 2x_2x_3 + 2x_1x_3$ into canonical form. [4]

15 Show that $J_{-\frac{1}{2}}(x) = \sqrt{\frac{2}{\pi x}} \cos x$, where $J_{-\frac{1}{2}}(x)$ is Bessel’s function. [4]

OR

Show that $n P_n(x) = x P_n'(x) - n P_{n-1}'(x)$, where $P_n(x)$ is Legendre’s polynomial. [4]

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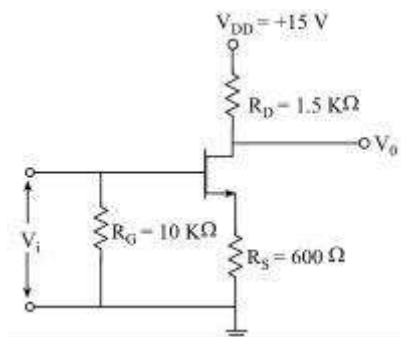
Examination Control Division
(Sample Question)

Exam.	Regular (New Course)		
Level	BE	Full Marks	60
Programme	BEI, BCT	Pass Marks	24
Year / Part	I / II	Time	3 hrs.

Subject: - Electronics Device and Circuits (EX 151)

- ✓ Candidates are required to give their answers in their own words as far as practicable.
- ✓ Attempt **All** questions.
- ✓ The figures in the margin indicate **Full Marks**.
- ✓ Assume suitable data if necessary.

1. Design BJT voltage divider bias circuit. Given: $\beta = 250$, $I_C = 2 \text{ mA}$, and $V_{CC} = +16 \text{ V}$. Use Firm biasing. [4]
2. Draw common emitter (CE) amplifier without by pass capacitor. Derive the expression of input resistance, output resistance and voltage gain. [5]
3. Derive the expression for small signal parameter r_{π} and r_e of BJT. [4]
4. Explain the working of n-channel JFET with characteristics curves and characteristic equation. [6]
5. Find I_D and V_{DS} of given circuit. [Given: $V_P = -4\text{V}$ and $I_{DSS} = 10 \text{ mA}$, [7]



6. Draw the circuit diagram of an RC phase shift oscillator and derive its frequency of oscillation. [4]
7. Draw the ckt diagram and explain working principle of square wave generator using op-amp. Derive its frequency of oscillation. [4]
8. Draw the circuit diagram of simple current mirror ckt. Explain why the output current is not exactly equal to reference current. [5]
9. Draw the circuit diagram and the characteristic curve of a transformer coupled class A amplifier and derive its general and maximum efficiency. [4]
10. Why Class B amplifier is refer as Push-Pull amplifier? Prove that the minimum efficiency of Class B amplifier is 50%. [5]
11. What is tank circuit? How can it be used as toned amplifier? [4]
12. Draw a series voltage regulator circuit with OP amplifier. Explain how it regulates the voltage. [2+2]
13. Design Dual power supply with $\pm 15 \text{ V}$ using fixed IC voltage regulator. [4]

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Examination Control Division
(Sample Question)

Exam.	Regular (New Course)		
Level	BE	Full Marks	60
Programme	BEL	Pass Marks	24
Year / Part	I / II	Time	3 hrs.

Subject: - Electronics Circuits (EX 154)

- ✓ Candidates are required to give their answers in their own words as far as practicable.
- ✓ Attempt **All** questions.
- ✓ The figures in the margin indicate **Full Marks**.
- ✓ Assume suitable data if necessary.

- 1 Discuss the working principles and applications of Zener diodes, LEDs, photodiodes, varactor diodes, and tunnel diodes. Focus on their unique characteristics and how these characteristics make them suitable for specific applications. [4]
- 2 Explain the I-V characteristics of a semiconductor diode. Discuss the forward and reverse bias operation in detail, including the effect of temperature on diode behavior. [4]
- 3 Discuss the small signal equivalent circuit models (π and T models) for a BJT. Explain the significance of each model and the parameters involved. How do these models help in analyzing transistor amplifier circuits? [6]
- 4 Consider a common-emitter (C-E) amplifier circuit with the following parameters: $V_{cc} = 15V$, $R_c = 2.2k\Omega$, $R_e = 1k\Omega$, β (current gain) = 100, $V_{be(on)} = 0.7V$, $V_{th} = 25mV$ (thermal voltage) **a.** Calculate the DC operating point (Q-point) of the transistor, including the base current (I_b), collector current (I_c), and collector-emitter voltage (V_{ce}). Assume a base resistor R_b is connected to a voltage source $V_{bb} = 2V$. **b.** Determine the voltage gain (A_v), input impedance (Z_{in}), and output impedance (Z_{out}) of the amplifier using the small signal model (π model). Assume a small signal input and that the bypass capacitor is ideal (i.e., R_e is bypassed). **c.** Analyze the effect of load resistance (R_L) of $4.7k\Omega$ on the overall voltage gain of the amplifier. Recalculate the voltage gain with the load connected and discuss the implications on signal amplification. [6]
- 5 Explain the operation of enhancement-type and depletion-type MOSFETs. Compare their structure, mode of operation, and applications. How do the current-voltage (I-V) characteristics differ between enhancement-type and depletion-type MOSFETs? [6]
- 6 Consider an enhancement-type n-channel MOSFET with the following parameters: $V_{DD}=12V$, $R_D=2.2k\Omega$, $R_S=1k\Omega$ (unbypassed), $V_{th}=2V$ (threshold voltage), $k_n'=200\mu A$ (transconductance parameter), $W/L=10$ (width-to-length ratio of the MOSFET) **a.** Determine the DC operating point (Q-point) of the MOSFET, including the drain current I_D and the drain-source voltage V_{DS} . Assume that the gate-source voltage V_{GS} is set by a voltage divider with $R_{G1}=1M\Omega$ and $R_{G2}=1M\Omega$ from V_{DD} . **b.** Calculate the small-signal voltage gain $A_v=V_{out}/V_{in}$ of the amplifier. Use the small-signal model of the MOSFET, considering the effect of the source resistor R_S on the gain. Assume the source resistance is not bypassed by a capacitor and calculate the impact on the gain. [6]

- 7 Explain the concept of virtual ground in an operational amplifier circuit. How does this concept apply to the inverting amplifier configuration? Provide an example where the virtual ground concept simplifies the circuit analysis. [4]
- 8 Describe the role of feedback in operational amplifier circuits. Compare positive and negative feedback and explain how each type affects the stability and operation of the circuit. Provide an example of an oscillator circuit that utilizes positive feedback to generate a sinusoidal waveform. [4]
- 9 Describe the operation of a Class AB output stage. Explain the biasing requirements for a Class AB amplifier and how it reduces crossover distortion compared to a Class B amplifier. Illustrate with a circuit diagram and explain the significance of setting the correct quiescent current. [6]
- 10 Consider a transformer-coupled push-pull Class B amplifier with the following parameters: Supply voltage $V_{CC}=20V$, Transformer primary winding resistance $R_p=10\Omega$, Load resistance $R_L=8\Omega$ (connected to the secondary winding), Turns ratio of the transformer $n=5$ **a.** Calculate the maximum output power delivered to the load. Assume ideal conditions and that the amplifier operates at full power without distortion. **b.** Determine the efficiency of the amplifier under these conditions. Discuss the factors that limit the efficiency of Class B amplifiers and how transformer coupling impacts these factors. [6]
- 11 Explain the operation of a Zener diode as a voltage regulator. How does the Zener breakdown mechanism help maintain a constant output voltage in an unregulated power supply? Provide a simple circuit diagram and describe the working. [4]
- 12 Describe the basic principle of an integrated circuit (IC) voltage regulator. What are the advantages of using an IC voltage regulator over discrete component regulators in power supply design? Provide an example of a commonly used IC voltage regulator and its typical application. [4]

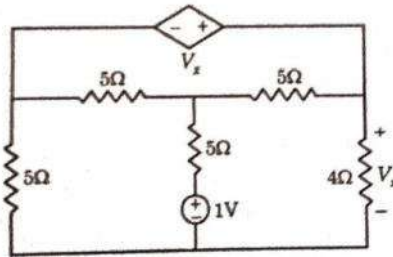
TRIBHUVAN UNIVERSITY
INSTITUTE OF ENGINEERING
Examination Control Division
(Sample Question)

Exam.	Regular (New Course)		
Level	BE	Full Marks	60
Programme	BCT/BEI	Pass Marks	24
Year / Part	I / II	Time	3 hrs.

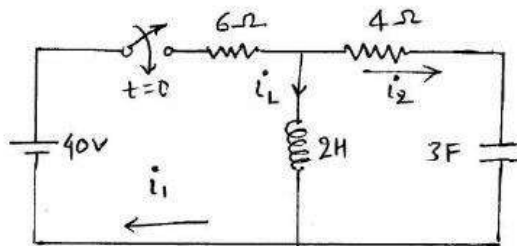
Subject: - Electrical Circuit and Machines (EE 154)

- ✓ Candidates are required to give their answers in their own words as far as practicable.
- ✓ Attempt **All** questions.
- ✓ The figures in the margin indicate **Full Marks**.
- ✓ Assume suitable data if necessary.
- ✓ Semi-log graph paper is to be provided (if necessary).

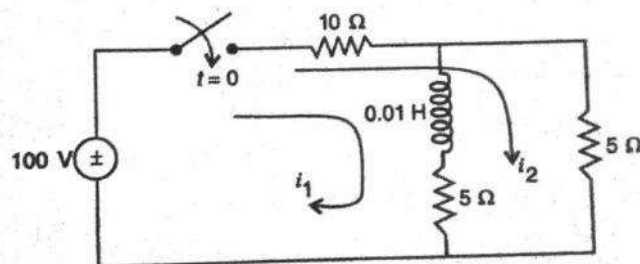
1. Using mesh analysis and matrix method solve the given network and find value V_x . [6]



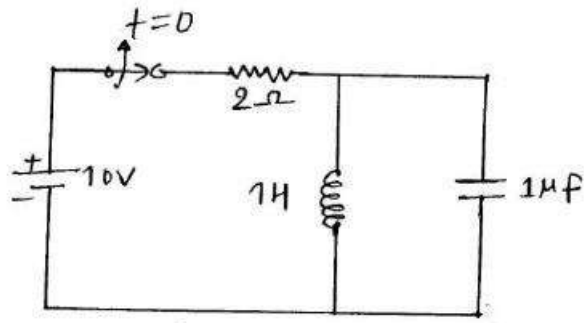
2. The switch is closed at $t=0$. Find at $t=0^+$, current and voltage of each element also calculate $\frac{di(t)}{dt}$ of coil and $\frac{dv(t)}{dt}$ of capacitor. [5]



3. Find the solution of current i_1 and i_2 for any time $t>0$, using classical approach. [6]



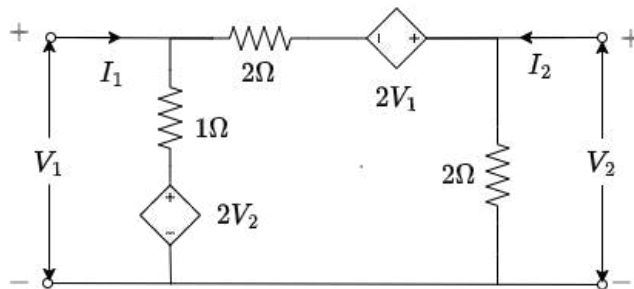
4. In the given with s/w closed steady state condition is reached and at $t=0$, switch is opened. Using Laplace transform method, find the expression for the current $i_L(t)$ through the inductor and its value at $t=5\text{ms}$. [6]



5. Sketch the asymptotic plot of given transfer function. [8]

$$G(s) = \frac{20(s + 5)}{(s + 10)(s^2 + 21s + 20)}$$

6. The network shown below is a two port network containing dependent voltage source. Obtain Z-parameters and T-parameters of the network. [6]



7. Explain the working principle of transformer on No Load. What are the different losses in transformer. [6]
8. A 4 pole, 250 V dc long shunt compound generator supplies a load of 10 kW at rated voltage. The armature, series field and shunt field resistances are 0.1 Ω, 0.15 Ω and 250 Ω respectively. The armature is lap wound with 50 slots, each slot containing 6 conductors. If the flux per pole is 50 mWb, calculate the speed of generator. [6]
9. Explain the construction of three phase induction motor? How rotating magnetic field is produced in three phase induction motor. [6]
10. Write short notes on following [any two] [2.5*2]
- Magnetic circuits
 - Universal motor
 - Dc motor starter

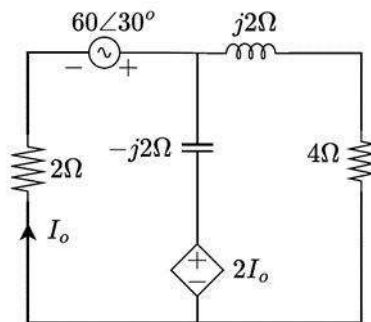
TRIBHUVAN UNIVERSITY
INSTITUTE OF ENGINEERING
Examination Control Division
(Sample Question)

Exam.	Regular (New Course)		
Level	BE	Full Marks	60
Programme	BEL	Pass Marks	24
Year / Part	I / II	Time	3 hrs.

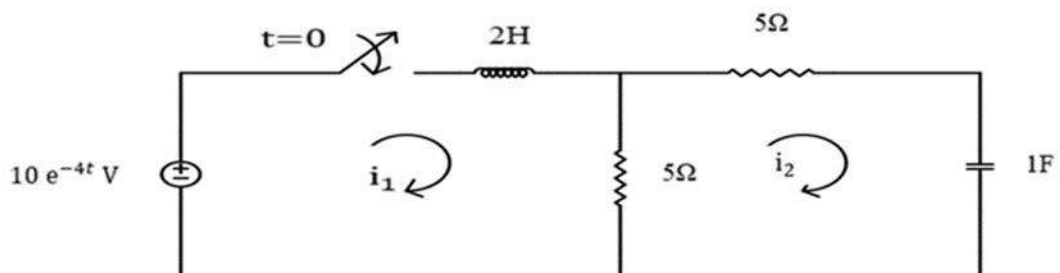
Subject: - Electric Circuit II (EE 151)

- ✓ Candidates are required to give their answers in their own words as far as practicable.
- ✓ Attempt **All** questions.
- ✓ The figures in the margin indicate **Full Marks**.
- ✓ Assume suitable data if necessary.

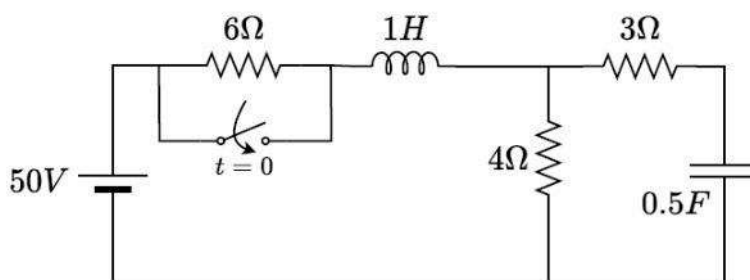
- 1 Using matrix method solve the given circuit to determine I_o using nodal method. [6]



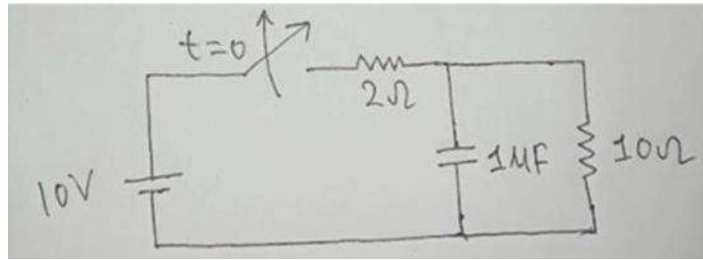
- 2 Find $i_1, i_2, \frac{di_1}{dt}, \frac{di_2}{dt}, \frac{d^2i_1}{dt^2}, \frac{d^2i_2}{dt^2}$ at $t=0^+$, if switch is closed at $t=0$ [6]



- 3 The switch in the circuit shown in figure is closed at $t=0$. Obtain the current through inductor for $t>0$. (Use Classical Approach). [6]

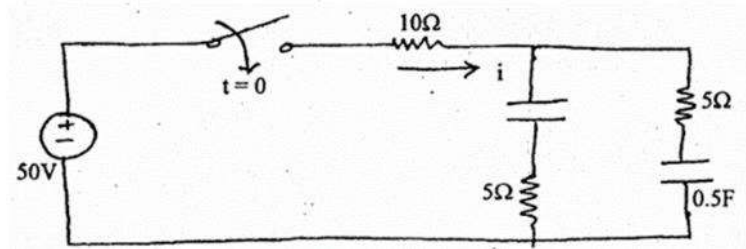


- 4 Find the expression of current and voltage across all elements for $t > 0$. Use Direct Solution Method. [6]



- 5 Obtain the Laplace transform of unit step and unit ramp function. [4]

- 6 Using the Laplace Transform method find the expression of current $i(t)$ in the network shown below for $t > 0$ when the switch is closed at $t=0$. [6]

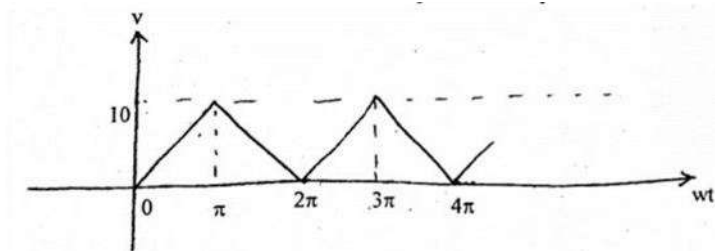


- 7 Obtain the transient response of series R-L circuit excited by a DC source and hence explain the nature of current. (Use Laplace Transformation method) [4]

- 8 Sketch the bode plot of the network transfer function given by; [8]

$$N(s) = \frac{s^2(s+30)}{(s+1)(s+5)}$$

- 9 Determine the fourier series and plot the spectrum of the given waveform. [6]



- 10 Define reciprocity theory. Derive the condition of reciprocity in terms of [T] parameters in a two port network [4]

- 11 Express g - parameter in terms of h parameter. [4]

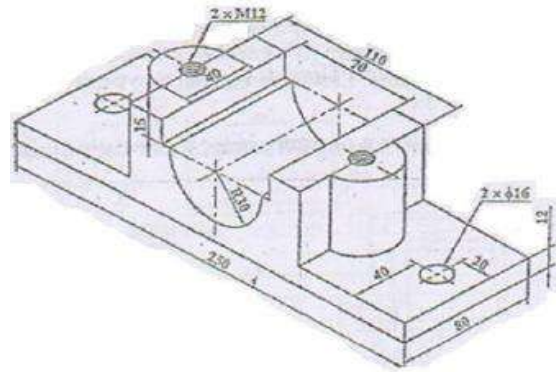
TRIBHUVAN UNIVERSITY
INSTITUTE OF ENGINEERING
Examination Control Division
(Sample Question)

Exam.	Regular (New Course)		
Level	BE	Full Marks	40
Programme	BGE	Pass Marks	16
Year / Part	I / II	Time	3 hrs.

Subject: - Drawing for Geomatics (GE 151)

- ✓ Candidates are required to give their answers in their own words as far as practicable.
- ✓ Attempt **All** questions.
- ✓ The figures in the margin indicate **Full Marks**.
- ✓ Assume suitable data if necessary.

1 a. Draw top view of the following block. [2]



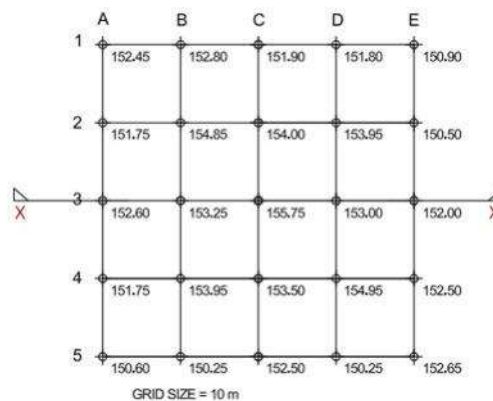
b. What are these symbols mean that you see in topographical map? [2]



c. Draw appropriate symbols for the following features: [2]

Trees, Streams, Bench Mark, International Boundary, Airport

2 a. Draw contours at an interval of 1m from the elevation data given in the form of grid in the following figure and label them with its correct value: [8]



b. Draw topographical profile of the terrain from the contour map that you have drawn above and label appropriately. [6]

- 3 a. Given below is a one-story building. Prepare site plan considering setback distance from the road center line based on the data provided herewith taking into account the Nepal National Building Code 2015. [10]

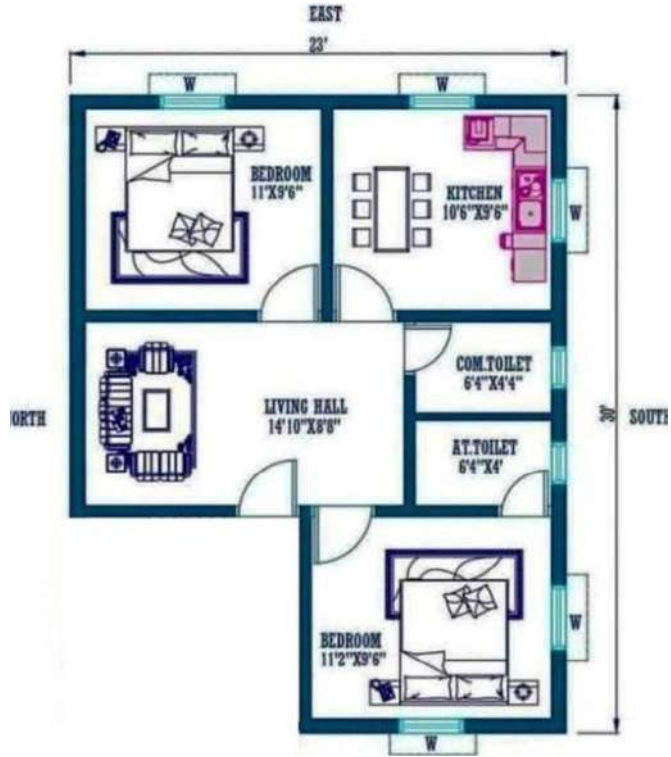
Road width / type– 12' / black-topped

Land parcel size = 30' x 40'

Rooftop projection = 24"

Building Height = 9' floor to floor plus plinth height (assume yourself)

Note: Ignore all dimension.



- b. Prepare a sectional elevation of the building across the line X-X' facing [8+2] towards north [8+2] with appropriate dimensions and labels. Put your drawing in a layout with all necessary information.

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(Sample Question)

Exam.	Regular (New Course)		
Level	BE	Full Marks	60
Programme	BEI/BCT	Pass Marks	24
Year / Part	I / II	Time	3 hrs.

Subject: - Digital Logics (EX 152)

- ✓ Candidates are required to give their answers in their own words as far as practicable.
- ✓ Attempt **All** questions.
- ✓ The figures in the margin indicate **Full Marks**.
- ✓ Assume suitable data if necessary.

- 1 Convert the followings as indicated: [3×1]
 - a. $(1101.1011)_2 = (?)_{10}$
 - b. $(101101)_2 = (?)_{\text{Grey}}$
 - c. $(B12.CD7)_{16} = (?)_8$

- 2 Define an BCD code. Use 1's complement method to perform the following addition $(-37 + 15)_{10}$ in the 16-bit signed number representation. [1+3]

- 3 Prove the following: [2x2]
 - a. $YZ + X(Y \oplus Z) = XZ + Y(X+Z)$
 - b. $AB + BC + \bar{A}C = AB + \bar{A}C$

- 4 Simplify the function using K-map $F = \sum m(0,1,3,4,7, 8,10,11,12)$ and $d = \sum m(2,5, 6,9,15)$. Also realize the simplified circuit using NOR gates only. [4+2]

- 5 Implement $Y(A, B, C) = \sum m(0, 1, 3, 6, 7)$ using only a single 4:1 DEMUX. Design a circuit which can realize both the full-adder and the full-subtractor in a single circuit. Hints: use mode switch (M). [3+7]

- 6 Design a 2-bit synchronous Gray code up/down counter using JK flip-flops [7]

- 7 Explain the operation of 4-bit serial-in parallel-out (SIPO) shift register with necessary circuit and timing diagram for 1101 input data. [3+3]

- 8 Draw the schematic diagram of three input TTL NAND gate and list the major parameters of CMOS logic family. [4+2]

- 9 Design a sequential machine that consists of one input, X and one output, Y. The machine gives output high (1), when it detects the sequence 1011 from its input data stream X. [10]

- 10 Explain the operation of multiplexing display techniques with the help of necessary diagrams and waveforms. [4]

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(Sample Question)

Exam.	Regular (New Course)		
Level	BE	Full Marks	30
Programme	BAR	Pass Marks	12
Year / Part	I / II	Time	1½ hrs.

Subject: - Building Construction –I (AR 153)

- ✓ Candidates are required to give their answers in their own words as far as practicable.
- ✓ Attempt **All** questions.
- ✓ The figures in the margin indicate **Full Marks**.
- ✓ Assume suitable data if necessary.

- 1 List out various methods to improve the bearing capacity of soil. Explain different types of shallow foundations. [2+4]
- 2 Define Excavation. Describe the process of timbering of dry loose soil with neat sketches. [2+4]
- 3 Explain various types of masonry wall according to its functions. Describe stone masonry and composite masonry. [3+3]
- 4 Explain the functions of a floor. Explain various types of flooring used for ground floors. [1+5]
- 5 Write short notes on: (Any Two) [2*4]
 - a. Sources of dampness
 - b. Necessity of building code
 - c. Gothic Arch
 - d. Site Investigation

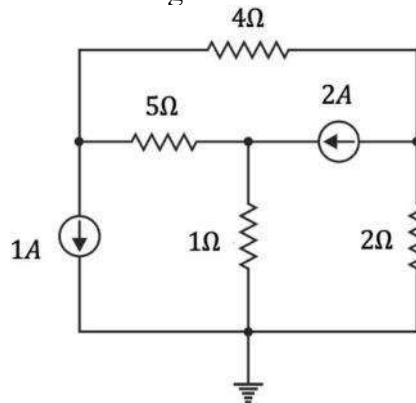
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Examination Control Division
(Sample Question)

Exam.	Regular (New Course)		
Level	BE	Full Marks	60
Programme	BAG/BGE	Pass Marks	24
Year / Part	I / II	Time	3 hrs.

Subject: - Basic Electrical & Electronics Engineering (EE153)

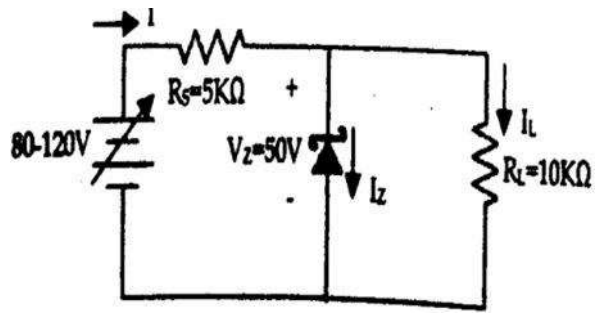
- ✓ Candidates are required to give their answers in their own words as far as practicable.
- ✓ Attempt **All** questions.
- ✓ The figures in the margin indicate **Full Marks**.
- ✓ Assume suitable data if necessary.

- 1 State Kirchoff's laws. Use nodal analysis to find the current and voltage drop through $5\ \Omega$ Resistor of the circuit shown in Fig below. [2+4]



- 2 A voltage of $e(t) = 169.2 \sin 314t$ V is applied across series RLC circuit consists of a resistor of 30 ohm, an inductor of 80 mH and a capacitor of 40 μ F. Find out the current in the circuit, power factor, active power consumed, reactive power consumed, voltage drop across each component. [6]
- 3 Three identical coils, each having resistance of $20\ \Omega$ and inductance of 0.07 H are connected in star across a three-phase, 380 V, 50 Hz supply. Calculate: 1) The phase current, ii) The line current, iii) The total power consumed, iv) p.f. and pf. angle. Draw a neat phasor diagram. [6]
- 4 A 3300/250 V, 50 Hz single phase transformer is built on a core having an effective cross-section area of 125 cm² and 70 turns on the low-voltage winding. Calculate ; [3+3]
(a) the value of maximum flux density,
(b) the number of turns on the high voltage winding.
- 5 Explain the different types of dc motor with their terminals voltage equation equations. [6]
- 6 What do you mean by rotating magnetic field? Explain the operation of three phase induction motor. [2+4]
- 7 Explain the operation of PN junction diode and draw graph of its IV characteristics. [4+2]

- 8 Find the maximum and minimum current through the Zener diode from the figure shown below. [3+3]



- 9 What is the different between wire and cable and explain the different types of power cable. [2+4]
- 10 Write short notes on (any two) [2*3]
- PNP transistor in the active mode
 - Electrical safety rules
 - Earthing System

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Examination Control Division
(Sample Question)

Exam.	Regular (New Course)		
Level	BE	Full Marks	60
Programme	BEL	Pass Marks	24
Year / Part	I / II	Time	3 hrs.

Subject: - Advance Computer Programming (CT 153)

- ✓ Candidates are required to give their answers in their own words as far as practicable.
- ✓ Attempt **All** questions.
- ✓ The figures in the margin indicate **Full Marks**.
- ✓ Assume suitable data if necessary.

- 1 Explain advantages and disadvantages of different computing paradigms with examples. [4]
- 2 Explain the features of python programming language and also list out its application domain. [2+2]
- 3 The Tower of Hanoi is a classic problem in recursion, where you have three rods and a number of disks of different sizes that can slide onto any rod. The puzzle starts with the disks stacked in ascending order of size on one rod, the largest disk on the bottom and the smallest at the top. The objective of the puzzle is to move the entire stack to another rod, obeying the following rules: [6]
 - a. Only one disk can be moved at a time.
 - b. Each move consists of taking the upper disk from one of the stacks and placing it on top of another stack or on an empty rod.
 - c. No disk may be placed on top of a smaller disk.

Write a Python program that solves the Tower of Hanoi problem using recursion. The program should output the steps required to move the disks from the source rod to the target rod.

- 4 Explain different data structures in python with examples for each. [4]
- 5 Using a two-dimensional list, perform matrix addition and store the result in the third matrix. [3]
- 6 Given a list of numbers: [10, 20, 30, 40], use the map() function along with a lambda function to calculate the square of each number in the list. [3]
- 7 Explain the features of object oriented programming languages. [4]

- 8 For given class diagram, write appropriate python code: [6]

Student
- Name: string - Age : int - Address: string
+ init () + display()

Include following methods in Student class:

- A constructor to initialize Name, Age and Address
- display() method should print the Name, Age and Address of given student object

- 9 Write python code to explain the concept of dynamic binding. [4]
- 10 Write python code to illustrate the concept of binary operator overloading. [4]
- 11 Write python code to write a multiplication table of a given number in a file called "product.txt". [3]
- 12 Explain different types of errors in python and how you can handle run time errors. [3]
- 13 Write a python program, to create a NumPy array and perform these operations: i) indexing, ii) Slicing, iii) Reshape [6]
- 14 Given the following system of linear equations: [6]
- $$3x + 4y = 10$$
- $$2x - y = 3$$
- Use NumPy to solve for the value of x and y
