

CBCS SCHEME

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18ME51

Fifth Semester B.E. Degree Examination, Feb./Mar. 2022 Management and Economics

Time: 3 hrs.

Max. Marks: 100

- Note: 1. Answer any FIVE full questions, choosing ONE full question from each module.
2. Use of Discrete compound interest factors handbook tables is permitted.

Module-1

- 1 a. Define management and explain the function to be performed by managers to attain the set goals. (10 Marks)
b. Define planning and briefly discuss the steps involved in planning. (10 Marks)

OR

- 2 a. Discuss the functional areas of management. (12 Marks)
b. Explain the steps involved in rotational decision making. (08 Marks)

Module-2

- 3 a. Write a note on principle of organization. (12 Marks)
b. Explain Marsha's need hierarchy theory in brief. (08 Marks)

OR

- 4 a. Explain the terms MBO and MBE. (10 Marks)
b. What is controlling and explain the steps in control process. (10 Marks)

Module-3

- 5 a. Explain the law of demand and law of supply with suitable examples. (08 Marks)
b. Explain the 72 rule of present worth. (04 Marks)
c. A man wishes to have a future sum of Rs.50 lakhs for his daughters education for 10 years from now. What is the single payment that he should deposit so that he gets the desired amount after 10 years. The bank offers 12% rate of interest, compounded annually. (08 Marks)

OR

- 6 a. Define engineering economics and briefly explain microeconomics and macroeconomics. (10 Marks)
b. A man is planning to build his house. He plans to invest Rs.40,000 per year for the next 10 years. The bank offers 12% interest rate compounded annually. Find the maturity value of his account after 10 years. (10 Marks)

Module-4

- 7 a. Explain future worth method of comparison. (06 Marks)
b. Explain IRR (Internal Rate of Return) and MARR (Minimum Acceptable rate of Return). (06 Marks)
c. Following are the estimates of two alternate investment made in two different machines in an industry. Find out which machine has the fastest payback period.

	Particulars	Machine A	Machine B
1	Initial investment	30,000	42,000
2	Annual receipts	20,000	26,000
3	Annual expenditures	5,500	7,000
4	Economics life	4 years	4 years

(08 Marks)

Important Note : 1. On completing your answers, compulsorily draw diagonal cross lines on the remaining blank pages.
2. Any revealing of identification, appeal to evaluator and /or equations written eg, 42+8 = 50, will be treated as malpractice.

OR

- 8 a. Rs.10 crores was generated by the management of an engineering college for the construction of its new mechanical science block. Annual maintenance of the block is estimated to be Rs.10 lakh. In addition Rs.12 lakh will be needed every 10 years for painting and Hoyer repairs. If the budget granted has to take care of perpetual maintenance, how much of the amount can be used for initial construction costs? Deposited funds can earn 6% rate of interest compounded annually. Assume that taxes and inflation do not come into picture. (12 Marks)
- b. What are the various method of comparing the worthiness of engineering projects. Explain any one method. (08 Marks)

Module-5

- 9 a. What are the various components/causes of depreciation? (05 Marks)
- b. Explain how selling price is fixed for a product and show all the components of cost. (05 Marks)
- c. An investment of Rs.8,000 is made by Suresh for his manually operated pen machine. Its salvage value after 5 years is Rs.1000. Find straight line depreciation expense? Find the book value at the end for each year and also. Find the depreciation fund collected at the end of 4th year. (10 Marks)

OR

- 10 a. Differentiate between estimation and testing. (05 Marks)
- b. Explain briefly the objectives of costing. (05 Marks)
- c. A cost iron component, as shown in figure below is to be manufactured. Estimate the selling price per piece from the following data :
- Density of material = 7.2gm/cc
 Cost of molten metal = Rs. 20/kg
 Process scrap = 20% of net weight
 Scrap return value = Rs.6/kg
 Administrative overheads = Rs.30/hour
 Sales overheads = 20% of factory cost
 Profit = 20% of factory cost
 Other expenditures are as follow :

Operation	Time/piece minutes	Labour cost per hour is Rs.	Shot overheads Rs./hour
Moulding and paring	15	20	60
Shot blasting	5	10	40
Fettling and inspections	6	10	40

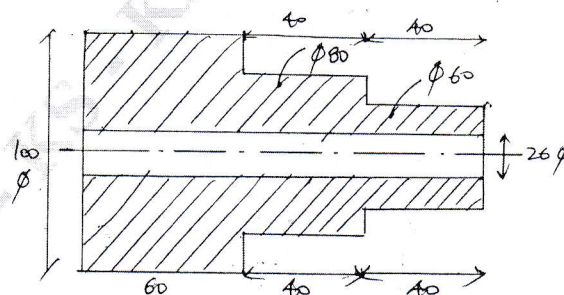


Fig.Q10(c) All dimensions are in 'mm'

(10 Marks)

CBCS SCHEME

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18ME52

Fifth Semester B.E. Degree Examination, Feb./Mar. 2022 Design of Machine Elements – I

Time: 3 hrs.

Max. Marks: 100

- Note: 1. Answer any FIVE full questions, choosing ONE full question from each module.
2. Use of design data handbook is permitted.

Module-1

- 1 a. Explain the factors which influence the selection of engineering materials. (05 Marks)
b. Explain codes and standards. List any four organizations who have established specifications for standards and codes. (05 Marks)
c. A machine member 60mm diameter is subjected to combined loading as shown in Fig.Q1(c). Determine the maximum principal stress and maximum shear stress at point P.

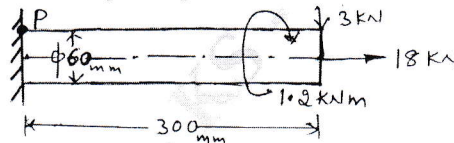


Fig.Q1(c)

(10 Marks)

OR

- 2 a. Explain even and uneven materials with the help of Mohr's circles. (04 Marks)
b. State and explain the following theories of failure:
(i) Maximum normal stress theory (ii) Maximum shear stress theory
(iii) Distortion energy theory (Hencky Von-Mises theory) (06 Marks)
c. A flat bar as shown in Fig.Q2(c) is subjected to an axial pull of 100 kN. Calculate its thickness if allowable tensile stress is 180 MPa.

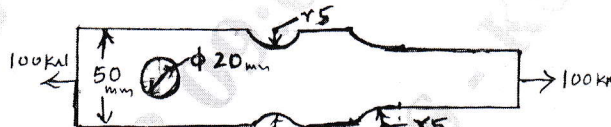


Fig.Q2(c)

(10 Marks)

Module-2

- 3 a. Obtain an expression for impact stress induced in a member subjected to axial load. (05 Marks)
b. A steel rod 1.5m long has to resist longitudinally an impact of 2.5 kN falling under gravity at a velocity of 0.9925 m/s. The maximum computed stress is to be limited to 150 MPa. Determine the diameter of the round rod. Take $E = 210 \text{ GPa}$. (07 Marks)
c. A beam of I-section 250mm depth has a moment of inertia of $60 \times 10^6 \text{ mm}^4$. It is simply supported at the ends at a distance of 3m apart. A weight of 3 kN falls at its middle from an unknown height. Determine the safe height 'h' taking the allowable stress as 90 MPa. Take $E = 210 \text{ GPa}$. (08 Marks)

OR

- 4 a. Obtain Soderberg's relation for a member subjected to fatigue loading. (05 Marks)
b. A steel connecting rod of rectangular cross-section having depth twice that of the width is subjected to a completely reversed axial load of 18 kN. The endurance stress is 300 MPa and yield stress is 420 MPa. Determine suitable cross-sectional dimensions of the connecting rod. Take size factor = 0.9, Load factor = 0.7, Surface factor = 0.85, Stress concentration factor = 1.5, Notch sensitivity = 1. Factor of safety = 1.8. Neglect column effect. (07 Marks)

- c. A steel rod ($\sigma_y = 400.1$ MPa and $\sigma_{-1} = 345.2$ MPa) of circular cross-section shown in Fig.Q4(c) is subjected to load varying from $3F$ to F . Determine the value of F . Use a factor of safety 3. Take stress concentration factor = 1.43, $q = 1$.

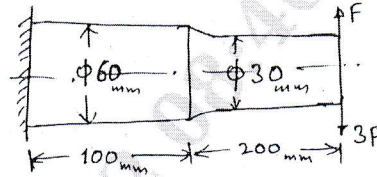


Fig.Q4(c)

Load factor = 1.0, Size factor = 0.85, Surface factor = 0.85.

(08 Marks)

Module-3

- 5 A commercial steel shaft 1m long supported between bearings carries a pulley of diameter 600mm weighing 1 kN located 400mm to the right of the right hand bearing and receives 25 kW at 1000 rpm by a horizontal belt drive. The power from the shaft is transmitted by a spur pinion of 20° pressure angle having pitch circle diameter 200mm to a spur gear such that the tangential force on gear acts vertically upwards. The pinion is keyed to the shaft at a distance of 200mm to the right of the left bearing. Taking the ratio of belt tensions as 3, determine the diameter of the shaft required. Use maximum shear stress theory. Take $\tau_d = 40$ N/mm².

(20 Marks)

OR

- 6 a. Select a rectangular sunk key to transmit 9 kW at 300 rpm. The yield stress for the steel used is 310 MPa. Take factor of safety as 2.5. (06 Marks)
- b. Design a rigid flange coupling (Un-protected) to transmit 18 kW at 1440 rpm. The allowable shear stress for CI flange is 4 MPa. The shafts, keys and bolts are made of annealed steel having allowable shear stress of 93 MPa. Take allowable crushing stress = 186 MPa for key. Take key way factor $\eta = 0.75$ for shaft. (14 Marks)

Module-4

- 7 a. Design a longitudinal joint for a boiler of 2m diameter subjected to a pressure of 1 MPa. The joint is a triple riveted butt joint with equal covers and efficiency of 85%. The pitch of the outer row is twice the pitch of inner rows. The arrangement is of chain type. Take allowable stress in tension = 117.67 N/mm², in shear = 70.6 N/mm² and in crushing = 176.50 N/mm². Take coefficient $k_1 = 6$ and corrosion allowance of 2 mm. (12 Marks)
- b. A bracket attached to a vertical column by means of four identical rivets, is subjected to an eccentric force of 25 kN as shown in Fig.Q7(b). Determine the diameter of rivets, if the permissible shear stress is 60 N/mm².

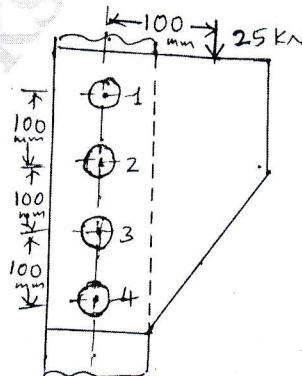


Fig.Q7(b)

(08 Marks)

OR

- 8 a. A welded connection as shown in Fig.Q8(a) is subjected to an eccentric force of 60 kN in the plane of the welds. Determine the size of the welds, if the permissible shear stress for the weld is 100 N/mm^2 . Assume static conditions.

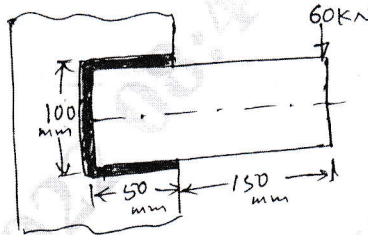


Fig.Q8(a)

(12 Marks)

- b. Determine the load carrying capacity of a welded joint loaded as shown in Fig.Q8(b). The allowable shear stress for 10mm weld used is 50 MPa.

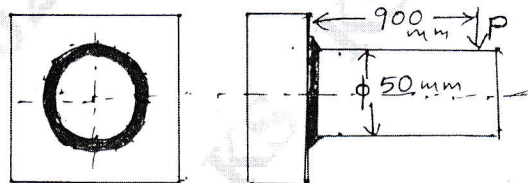


Fig.Q8(b)

(08 Marks)

Module-5

- 9 a. It is required to design a cottor joint to connect two steel rods of equal diameter. Each rod is subjected to axial tensile force of 50 kN. Design the joint and specify main dimensions. Take permissible stresses for rods in tension = 67 N/mm^2 . Crushing = 134 N/mm^2 and for cottor in tension = 100 N/mm^2 . (08 Marks)
- b. Explain self-locking in power screws. (02 Marks)
- c. A bracket is bolted as shown in Fig.Q9(c). All the bolts are of same size and are made of steel having allowable tensile stress of 90 MPa and allowable shear stress of 52 MPa. Determine the size of the bolts to be used.

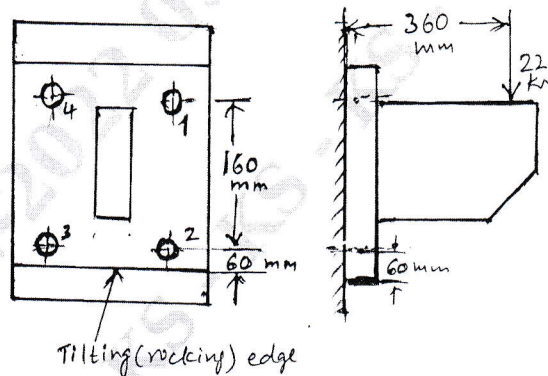


Fig.Q9(c)

(10 Marks)

OR

- 10 a. Obtain an expression for torque required to raise the load in power screws. (08 Marks)
- b. Enumerate four typical applications of knuckle joint. (02 Marks)
- c. A machine weighing 20 kN is to be raised by a single start square threaded screw rod of 50mm diameter, 8mm pitch screw jack at a maximum speed of 6 m/minute. If the coefficient of friction for threads is 0.2, determine the power required to raise (lift) the machine. The inside and outside diameters of the thrust collar are 30 and 60mm respectively. The coefficient of friction for collar is 0.1. (10 Marks)

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18ME53

Fifth Semester B.E. Degree Examination, Feb./Mar. 2022

Dynamics of Machines

Time: 3 hrs.

Max. Marks: 100

Note: Answer any FIVE full questions, choosing ONE full question from each module.

Module-1

- 1 a. Define static equilibrium. State two conditions for equilibrium (04 Marks)
- b. In a slider crank mechanism, the force applied to the piston is 1 kN, when the crank is at 60° from IDC. The length of the crank is 100mm and connecting rod is 300 mm. Calculate the driving torque T_2 on the crank to attain equilibrium. (16 Marks)

OR

- 2 The dimensions of a four-link mechanism are $AB = 500\text{mm}$, $BC = 660\text{mm}$, $CD = 560\text{mm}$ and $AD = 1000\text{mm}$. The link AB has an angular velocity of 10.5 rad/sec counterclockwise and an angular retardation of 26 rad/sec^2 at the instant when it makes an angle of 60° with AD, the fixed link. The mass of the links BC and CD is 4.2 kg/m length. The link AB has a mass of 3.54 kg , the center of which lies at 200mm from A and a moment of inertia of $88,500 \text{ kg-mm}^2$. Neglecting gravity and friction effects, determine the instantaneous value of the drive torque required to be applied on AB to overcome the inertia forces. (20 Marks)

Module-2

- 3 a. Justify the need of balancing of rotating parts for high speed engines. What is the difference between static and dynamic balancing? (04 Marks)
- b. A shaft carries four masses A, B, C and D placed in parallel planes perpendicular to the shaft axis and in this order along the shaft. The masses B and C are 40 kg and 28 kg and both are at 160mm radius. While the masses in planes A and D are at 200 mm radius. Angle between B and C is 100° , B and A is 190° , both angles being measured in the same sense. Planes A and B are 250mm apart, B and C are 500mm apart. If the shaft is to be in complete balance, determine (i) Masses in planes A and D (ii) Distance between planes C and D (iii) Angular position of mass D. (16 Marks)

OR

- 4 The pistons of a 4 cylinder vertical inline engine reach their uppermost position at 90° interval in order of their axial position. Pitch of cylinder is 0.35m , crank radius is 0.12m , length of connecting rod is 0.42m . The engine runs at 600rpm . If the reciprocating parts of each engine has a mass of 2.5kg , find the unbalanced primary and secondary forces and couples. Take central plane of engine as reference plane. (20 Marks)

Module-3

- 5 a. Define the following terms with reference to governors:
(i) Sensitiveness (ii) Hunting (iii) Isochronism (iv) Governor power (08 Marks)
- b. Each arm of a porter governor is 300mm long and is pivoted on the axis of the governor. Each ball has a mass of 6 kg and the mass of sleeve is 18kg , the radius of rotation of ball is 200mm when the governor begins to lift and 250mm when the speed is maximum. Determine the maximum and minimum speed and range of speed of the governor. (12 Marks)

OR

- 6 a. Define gyroscopic effect. With usual notations and diagram, derive an expression for the gyroscopic couple produced by a rotating disc. (08 Marks)
- b. An aeroplane has engine speed 2000rpm clockwise when viewed from rear. It is flying at 240 kmph speed and turns towards left and completes a quarter circle of 60m radius. The mass of the rotor engine and the propeller of the plane is 450kg with a radius of gyration of 320 mm. Determine the gyroscopic couple on the aircraft and its effect. In what way the effect changes when the (i) Aeroplane turns towards right (ii) Engine rotates clockwise when viewed from the front (nose end) and the aeroplane turns right. (12 Marks)

Module-4

- 7 a. Define the following terms:
 (i) Simple harmonic motion (ii) Natural frequency (iii) Resonance
 (iv) Forced vibration (v) Phase difference (10 Marks)
- b. Find the natural frequency of the following system shown in Fig.Q7(b). (10 Marks)

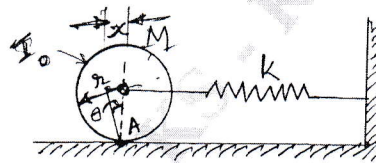


Fig.Q7(b)

OR

- 8 a. Set up the differential equation for a spring mass damper system and obtain complete solution for the over-damped system. (10 Marks)
- b. A vibrating system consists of mass 25kg, a spring of stiffness 15 kN/m and a Damper. The damping provided is only 15% of critical value. Determine (i) Critical damping coefficient (ii) Damping factor (iii) Natural frequency (iv) Logarithmic decrement (v) Ratio of two consecutive amplitudes of vibration. (10 Marks)

Module-5

- 9 a. Define transmissibility and derive an expression for the transmissibility ratio and the phase angle for the transmitted force. (10 Marks)
- b. A mass of 100 kg has been mounted on a spring-dash pot system having spring stiffness of 19600 N/m and damping coefficient 100 N-sec/m. The mass acted upon by a harmonic force of 39N at the undamped natural frequency of the system; find
 (i) Amplitude of vibration of the mass
 (ii) Phase difference between the force and displacement
 (iii) Force transmissibility ratio. (10 Marks)

OR

- 10 a. Derive an expression for magnification factor or amplitude ratio for spring mass system with viscous damping subjected to harmonic force. (10 Marks)
- b. A 54 N weight is suspended by a spring with a stiffness of 1100 N/m. It is forced to vibrate by a harmonic force of 5 N. Take viscous damping of 77 N-s/m and find,
 (i) Resonant frequency (ii) Amplitude at resonance (iii) Phase angle at resonance.
 (iv) Damped natural frequency (v) Frequency at which maximum amplitude of vibration occurs (vi) Maximum or Peak amplitude (vii) Phase angle corresponding to peak amplitude (viii) Speed at which maximum amplitude of vibration would occur. (10 Marks)

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Fifth Semester B.E. Degree Examination, Feb./Mar.2022 Turbo Machines

Time: 3 hrs.

Max. Marks: 100

Note: Answer any FIVE full questions, choosing ONE full question from each module.

Module-1

- 1 a. Differentiate between turbo machine and positive displacement machine under the following aspects (i) Action (ii) Operation (iii) Mechanical features (iv) Efficiency of energy conversion (v) Volumetric efficiency (10 Marks)
- b. A $\frac{1}{4}$ scale turbine model is tested under a head of 10 meters. The prototype is required to work under a head of 30 meters and to run at 425 rpm. Estimate the speed of the model if it develops 125 kW and uses $1.1 \text{ m}^3/\text{sec}$ of water at this speed. Also calculate the power output, discharge of prototype and suggest the type of turbine. (10 Marks)

OR

- 2 a. Explain static and stagnation state for a fluid. (04 Marks)
- b. Show that polytropic efficiency for compressor is given by $\eta_p = \left(\frac{r-1}{r}\right) \times \left(\frac{n}{n-1}\right)$. (08 Marks)
- c. A turbine has four stages and each stage pressure ratio is 2. The inlet static temperature is 630°C . The mass flow rate is 30 kg/sec . The overall efficiency is 0.8. Calculate
- (i) Polytropic efficiency (ii) The stage efficiency
- (iii) The power developed (iv) Reheat factor. (08 Marks)

Module-2

- 3 a. Define degree of reaction and utilization factor. Derive relation between degree of reaction and utilization factor. (10 Marks)
- b. In an axial flow machine (turbine), the discharge blade angles are 20° each for both stator and rotor. The steam speed at the exit of the fixed blade is 140 m/sec . The ratio $\frac{V_r}{U} = 0.7$ at the entry and 0.76 at the exit of the rotor blade. Find the inlet rotor angle, the power developed by the blade ring for a mass flow rate of 2.6 kg/sec and the degree of reaction. (10 Marks)

OR

- 4 a. A radial outward flow turbo machine has no inlet whirl. The blade speed at the exit is twice that at inlet. Radial velocity is constant throughout. Taking the inlet blade angle as 45° . Show that the degree of reaction is given by $R = \frac{2 + \cot\beta_2}{4}$, where β_2 is the blade angle at exit with respect to tangential direction. (10 Marks)
- b. An inward flow turbine has water inlet angle of 20° , the water leaves radially, speed of wheel = 350 rpm . Velocity of flow is 4 m/sec . The inner and outer diameter of the turbine are 30 cm and 60 cm respectively. Width of the wheel at inlet is 12 cm . Find the blade angle of power developed. Also what will be the value of R. (10 Marks)

Module-3

- 5 a. What is compounding? Explain (i) Velocity compounding and (ii) Pressure compounding with neat sketches. (10 Marks)
- b. A single stage impulse turbine has a diameter of 1.5 m and running at 3000 rpm. The nozzle angle is 20° . Speed ratio is 0.45. The ratio of relative velocity at outlet to that at inlet is 0.9. The outlet angle of the blade is 3° less than inlet angle. Steam flow rate is 6 kg/sec. Draw the velocity diagram and find the following : (i) Velocity of whirl (ii) Axial thrust (iii) Blade angles (iv) Power developed. (10 Marks)

OR

- 6 a. Derive condition for maximum efficiency of reaction steam turbine and hence prove that
$$\eta_{b,max} = \frac{2 \cos^2 \alpha_1}{1 + \cos^2 \alpha_1}$$
 (10 Marks)
- b. In a Parson's turbine the axial velocity of flow of steam is 0.5 times the mean blade speed. The outlet angle of blade is 20° , the diameter of the blade ring is 1.3 m and the rotational speed is 3000 rpm. Determine inlet blade angles, power developed for the steam flow of 65 kg/sec and the isentropic enthalpy drop, if the stage efficiency is 80%. (10 Marks)

Module-4

- 7 a. With a mathematical expression, define the following : (i) Hydraulic efficiency (ii) Mechanical efficiency (iii) Overall efficiency (iv) Volumetric efficiency. (08 Marks)
- b. Show that the maximum efficiency of Pelton wheel is given by $\eta_{b,max} = \frac{1 + C_b \cos \beta_2}{2}$, where C_b = Blade velocity coefficient, β_2 = Bucket angle at its outlet. (12 Marks)

OR

- 8 a. Explain the functioning of a Kaplan turbine, with help of a sectional arrangement diagram. Draw the velocity triangles of Kaplan turbine. (08 Marks)
- b. The following data is given for a Francis turbine, net head = 70 m, Speed = 600 rpm, Shaft power = 370 kW, $\eta_o = 0.80$, $\eta_h = 0.95$, flow ratio = 0.25, breadth ratio is equal to 0.1, outer diameter of runner is equal to two times inner diameter of the runner. The thickness of vanes occupy 10% circumferential area of the runner. Velocity of flow is constant and discharge is radial at outlet. Determine (i) Guide blade angle (ii) Runner angle at inlet and outlet (iii) Diameter of the runner at inlet and outlet (iv) Width of the wheel at inlet. (12 Marks)

Module-5

- 9 a. Define the following with respect to centrifugal pump, (i) Static head (ii) Cavitation (iii) Priming (iv) Multistage centrifugal pumps. (08 Marks)
- b. Derive an expression for minimum starting speed for a centrifugal pump. (06 Marks)
- c. A centrifugal pump discharges $0.15 \text{ m}^3/\text{s}$ of water against a head of 12.5 m, speed of impeller is 600 rpm. The outer and inner diameter of impeller are 500 mm and 250 mm respectively and the vanes are bent back at 35° to the wheel tangent at exit. If the area of flow remains 0.07 m^2 from inlet to, outlet, find (i) Manometric efficiency (ii) Vane angle at inlet (06 Marks)

OR

- 10 a. Explain the following with respect centrifugal compressor: (i) Pressure coefficient (ii) Slip factor (iii) Power factor (iv) Surging (08 Marks)
- b. A centrifugal compressor runs at a speed of 15000 rpm and delivers air at 30 kg/sec. Exit radius is 0.35 m, relative velocity and vane angles at exit are 100 m/s and 75° . Assuming axial inlet, inlet stagnation temperature and pressure as 300 K and 1 bar. Calculate (i) The torque (ii) The power required to drive the compressor. (iii) The ideal head developed (iv) The work done (v) The exit total pressure. Take $C_{p,air} = 1.005 \text{ kJ/kg}$. (12 Marks)

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18ME55

Fifth Semester B.E. Degree Examination, Feb./Mar. 2022 Fluid Power Engineering

Time: 3 hrs.

Max. Marks: 100

Note: Answer any FIVE full questions, choosing ONE full question from each module.

Module-1

- 1 a. Define fluid power system. Sketch and explain the structure of a hydraulic control system. (08 Marks)
- b. State Pascal's law and explain its applications. (06 Marks)
- c. A force of 500 N is applied on a plunger of 5 cm diameter of a hydraulic press that moves the piston through a distance of 20 cm. What is the maximum weight of the load that can be placed on the ram and what will be the displacement of the ram, if the diameter of the ram is 40 cm. (06 Marks)

OR

- 2 a. What are the desirable properties of hydraulic fluids? Explain them. (08 Marks)
- b. Define a seal. Explain in brief, how hydraulic seals are classified. (08 Marks)
- c. What are the methods to control contamination in a system? (04 Marks)

Module-2

- 3 a. Explain the working principle of an external gear pump. (05 Marks)
- b. What are the factors considered for selecting a hydraulic pump and explain the pumping theory of positive displacement pumps? (09 Marks)
- c. A vane pump has its rotor and cam ring diameters of 60 mm and 80 mm respectively. If the volumetric displacement is $90 \text{ cm}^3/\text{rev}$ and the width of the vane is 3 cm, what is eccentricity? What is the maximum displacement possible? (06 Marks)

OR

- 4 a. Explain the following with neat sketches:
(i) Single-acting cylinder
(ii) Telescopic cylinder (08 Marks)
- b. What is a hydraulic motor? What are the four broad basis of classification of hydraulic motors? (05 Marks)
- c. A hydraulic motor has a volumetric displacement of 123 cm^3 operating at a pressure of 60 bar and speed 180 rpm. If the actual flow rate consumed by the motor is $0.004 \text{ m}^3/\text{sec}$ and actual torque delivered by motor is 100 Nm, find:
(i) Volumetric efficiency (ii) Mechanical efficiency (iii) Overall efficiency. (07 Marks)

Module-3

- 5 a. Explain with a neat sketch, the principle of working of a pilot operated pressure relief valve. Draw the graphical symbol of the valve. (07 Marks)
- b. With a neat sketch, explain the working of a check valve. (06 Marks)
- c. Define control valves. Explain the classification of control valves. (07 Marks)

OR

Important Note : 1. On completing your answers, compulsorily draw diagonal cross lines on the remaining blank pages.
2. Any revealing of identification, appeal to evaluator and /or equations written eg, $42+8=50$, will be treated as malpractice.

- 6 a. Explain the following with neat sketches:
(i) Sliding spool flow control valve
(ii) Needle flow control valve (04 Marks)
- b. Explain the concept of meter-in and meter-out circuits. List the advantages and limitations of each of the circuit. (10 Marks)
- c. What is a regenerative circuit? Sketch schematically regenerative circuit to increase the regenerative speed of the cylinder. (06 Marks)

Module-4

- 7 a. What are the advantages, disadvantages and applications of pneumatic system? (07 Marks)
- b. Explain the characteristics of compressed air. (04 Marks)
- c. Explain the construction and working of single and double acting cylinder. (09 Marks)

OR

- 8 a. Briefly explain cylinder cushioning. (08 Marks)
- b. Explain with a suitable circuit diagram, Quick Exhaust Valve. (06 Marks)
- c. Explain with a neat sketch, the construction of poppet valves. (06 Marks)

Module-5

- 9 a. Explain the following functions generated in pneumatic systems:
(i) OR gate
(ii) AND gate
(iii) NOT gate (12 Marks)
- b. Explain direct and indirect actuation of pneumatic cylinders. (08 Marks)

OR

- 10 a. Write short notes on the following:
(i) Solenoid
(ii) Electromagnetic Relay (08 Marks)
- b. What are the advantages of cascade design? (03 Marks)
- c. Explain with a neat sketch, coordinated sequence motion of two cylinders. (09 Marks)

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18ME56

Fifth Semester B.E. Degree Examination, Feb./Mar.2022

Operations Management

Time: 3 hrs.

Max. Marks: 100

Note: Answer any FIVE full questions, choosing ONE full question from each module.

Module-1

- 1 a. Explain briefly with a schematic model the functions of business organization and operation management within them. (08 Marks)
- b. Define productivity and explain the factors that affect productivity. (06 Marks)
- c. Determine the productivity and multi factor productivity respectively for the cases:
- (i) Four workers installed 720 sq m of carpeting in 8 hours.
- (ii) For the combined input of labour and machine time using the following :
- Output : 7040 units
- Input : Labour : Rs. 1000.00
- Materials : Rs.520.00
- Overhead : Rs.2000.00 (06 Marks)

OR

- 2 a. What are models? Explain different types of models. (06 Marks)
- b. A firm produces two types of microcomputers. The following data is available:

Profit/Unit	Rs.6000.00	Rs.5000.00
Assembly time per unit	4 hours	10 hours
Inspection time per unit	2 hours	1 hour
Storage space per unit	3 cub ft	3 cub ft

The available resources :

Resource	Amount available
Assembly time	100 hours
Inspection time	22 hours
Storage space	39 cubic feet

Formulate as LPP and solve by graphical method to find quantities of Type 1 and Type 2. (14 Marks)

Module-2

- 3 a. Explain the following forecasting methods :
- (i) Linear regression
- (ii) Exponential smoothing. (08 Marks)
- b. Given the following data:

Period	Number of complaints
1	60
2	65
3	55
4	58
5	64

Prepare a forecast using each of these approaches:

- (i) A three period moving average.
- (ii) A weighted average using weights of 0.5 (most recent), 0.30 and 0.2.
- (iii) Exponential smoothing with a smoothing constant of 0.40. (12 Marks)

Important Note : 1. On completing your answers, compulsorily draw diagonal cross lines on the remaining blank pages.
2. Any revealing of identification, appeal to evaluator and /or equations written eg, 42+8 = 50, will be treated as malpractice.

OR

- 4 a. Explain the steps in the forecasting process. (06 Marks)
 b. What is Delphi method? Brief. (04 Marks)
 c. The mobile phone sales for a company over the last 10 weeks are shown in below table. Plot the data and visually check to see if a linear trend line would be appropriate. Then determine the equation of the trend line and predict sales for weeks 11 and 12.

Week	Unit sales	Week	Unit sales
1	700	6	742
2	724	7	756
3	720	8	750
4	726	9	770
5	738	10	780

(10 Marks)

Module-3

- 5 a. List the factors that determine effective capacity and explain any four. (06 Marks)
 b. Explain bottle neck operation with a neat diagram. (06 Marks)
 c. A small firm produces and sells automotive items in a five state area. The firm experts to consolidate assembly of its battery chargers line at a single location. Currently operations are in three widely scattered locations. The leading candidate for location will have a monthly fixed cost of Rs.42 lakhs and variable cost of Rs.200/charger. Chargers sell for Rs.700 per charger. Prepare a table that shows total profits, fixed costs variable costs, and revenues for monthly volumes of 10,000, 12,000 and 15,000 units. What is the break even point? Determine the profit when volume equals 22000 units. (08 Marks)

OR

- 6 a. What are factors that affect location decision? Explain. (10 Marks)
 b. Fixed and variable costs for four potential plant locations are shown below:

Location	Fixed cost/year	Variable cost/unit
A	Rs.2,50,000.00	Rs.110.00
B	Rs.1,00,000.00	Rs.300.00
C	Rs.1,50,000.00	Rs.200.00
D	Rs.2,00,000.00	Rs.350.00

- (i) Plot the total cost lines for these locations on a single graph.
 (ii) Identify the range of output for which each alternative is superior.
 (iii) If expected output at the selected location is to be 8000 units/year, which location would provide the lowest total cost? (10 Marks)

Module-4

- 7 a. Briefly explain the aggregate planning with the help of a flow chart. (06 Marks)
 b. Given the following information setup the problem in a transportation table and solve for the minimum cost plan by least cost method.

	Period		
	1	2	3
Demand	500	700	750
Regular	500	500	500
Capacity over time	50	50	50
Sub contract	120	120	100

Costs : Initial Inventory : 100

Regular time : Rs. 60/unit

Sub contracting : Rs. 90/unit

Inventory carrying cost : Rs.1/unit/month

Back order cost : Rs.3/unit/month

(14 Marks)

OR

- 8 a. Explain master scheduling process with the help of a flow chart. (08 Marks)
 b. Determine : the projected on hand inventory, the master production schedule and the uncommitted inventory (ATP – Available To Promise) for the following data and production capacity is 70 pumps. Forecast are shown in table.

Beginning Inventory 64	June (weeks)				July (weeks)			
Week	1	2	3	4	5	6	7	8
Forecast	30	30	30	30	40	40	40	40
Customer orders (committed)	33	20	10	4	2	-	-	-

(12 Marks)

Module-5

- 9 a. Explain with schematic model an overview of MRP. (10 Marks)
 b. The Fig.Q9 (b) shows product structure tree for end Item X i.e.Chairs

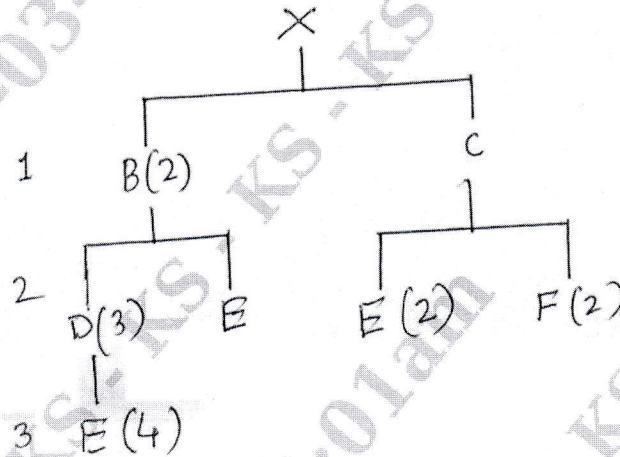


Fig. Q9 (b)

- (i) Determine the quantities of B, C, D, E and F needed to assemble one X.
 (ii) Determine the quantities of these components that will be required to assemble 10Xs, taking into account the quantities on hand (i.e. an inventory) of various components:

Component	On Hand
B	4
C	10
D	8
E	60

(10 Marks)

OR

- 10 a. What is supply chain? Explain supply chain management with a schematic model. (10 Marks)
 b. Describe Bull whip effect with a diagram. (05 Marks)
 c. Briefly explain elements of supply chain management. (05 Marks)

CBCS SCHEME

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Question Paper Version : A

Fifth Semester B.E. Degree Examination, Feb./Mar. 2022

Environmental Studies

(COMMON TO ALL BRANCHES)

Time: 2 hrs.]

[Max. Marks: 100

INSTRUCTIONS TO THE CANDIDATES

1. Answer all the hundred questions, each question carries **ONE** mark.
2. Use only **Black ball point pen** for writing / darkening the circles.
3. **For each question, after selecting your answer, darken the appropriate circle corresponding to the same question number on the OMR sheet.**
4. Darkening two circles for the same question makes the answer invalid.
5. **Damaging/overwriting, using whiteners** on the **OMR** sheets are strictly prohibited.

-
1. The word Environment is derived from
 - a) Greek
 - b) French
 - c) Spanish
 - d) English
 2. Primary consumer
 - a) Herbivores
 - b) Carnivores
 - c) Macro consumer
 - d) Omnivores
 3. Abiotic component includes
 - a) Soil
 - b) Temperature
 - c) Water
 - d) All the three
 4. Atmosphere consists of 79% Nitrogen and 21% oxygen by
 - a) Volume
 - b) Weight
 - c) Density
 - d) All the three
 5. Which of the following is a biotic component of an eco system
 - a) Fungi
 - b) Solar light
 - c) Temperature
 - d) Humidity
 6. Which pyramid is always upright
 - a) Energy
 - b) Biomass
 - c) Number
 - d) Food chain
 7. Which of the following conceptual sphere of environment is having the least storage capacity for matter.
 - a) Atmosphere
 - b) Lithosphere
 - c) Hydrosphere
 - d) Biosphere

8. The objective of environment education is
a) Raise consciousness about environmental conditions
b) To teach environmentally appropriate behavior
c) Create an environmental ethic.
d) All of the above
9. The sequence of eating and being eaten in an ecosystem is called
a) Food chain
b) Carbon cycle
c) Hydrological cycle
d) Anthroposystem
10. The largest reservoir of Nitrogen in our planet is
a) Ocean
b) Atmosphere
c) Biosphere
d) Hydrosphere
11. Which of the following is a producer in an ecosystem
a) Plant and some bacteria capable of producing their own food
b) Animals
c) Humanbeing
d) Fish
12. The basic requirements of human being are provided by
a) Industrialization
b) Agriculture
c) Nature
d) Urbanization
13. In an ecosystem biological cycling of materials is maintained by
a) Producer
b) Consumer
c) Decomposer
d) All of these
14. A predator is
a) An animal that is fed upon
b) An animal that feeds producers
c) An animal that hunts and feeds on their animals
d) A primary consumer
15. The major atmospheric gas layer in stratosphere is
a) Hydrogen
b) Carbon-dioxide
c) Ozone
d) Helium
16. Which atmospheric sphere is closest to the earth surface
a) Troposphere
b) Starto sphere
c) Mesosphere
d) Exosphere
17. World environmental day is on
a) 5th May
b) 5th June
c) 22nd July
d) 5th July
18. Which of the following is absorbed by green plants from the atmosphere
a) Carbon dioxide
b) Water
c) Nutrients
d) All of the above
19. Habitat refer to
a) Physical conditions of the place where organism live
b) Chemical conditions of the place where organism live.
c) Both a and b
d) None of a and b
20. A food web consists of
a) A portion of a food chain
b) An organisms position in a food chain
c) Interlocking of food chain
d) A set of similar consumer

21. In an ecosystem the flow of energy is
a) Bidirectional b) Cyclic c) Unidirectional d) Multidirectional
22. Estuary means
a) Rich in nutrients
b) End point of the river
c) Meeting place of river and sea
d) Treatment of water
23. What percentage of its geographical area of a country should be under forest cover?
a) 23% b) 43% c) 13% d) 33%
24. Mineral resources are
a) Renewable b) Available in plenty c) Non-renewable d) Equally distributed
25. Which of the following is considered as an alternate fuel
a) CNG b) Kerosene c) Coal d) Petrol
26. Chernobyl nuclear disaster occurred in the year
a) 1984 b) 1972 c) 1986 d) 1987
27. Electromagnetic radiation can cause
a) Plague b) Malaria c) Cancer d) Fever
28. OTEC is an energy technology that convert
a) Energy in large tides ocean to generate electricity
b) Energy in ocean wave to generate electricity
c) Energy in ocean due to thermal gradient to generate electricity
d) Energy in the fast moving ocean current to generate
29. Direct conversion of solar energy is attained by
a) Solar photo voltaic system
b) Solar hybrid system
c) Solar thermal system
d) Solar air heater
30. Hydrogen energy can be trapped through
a) Heat pump b) Fuel cell
c) Photovoltaic cell d) Cell
31. Cow dung can be used
a) As manure b) For production of bio gas
c) As fuel d) All of the above
32. Natural gas contains
a) CO₂ b) H₂ c) CH₄ d) N₂
33. Nuclear waste is active for
a) 10 years b) 50 years c) 70 years d) Centuries
34. Molasses from sugar industry is used to generate
a) Biodiesel b) Hydrogen c) Bio-ethanol d) Bio methanol
35. Nuclear power plant in Karnataka is located at
a) Bhadravathi b) Kaiga c) Raichur d) KGF

36. Which resources are in exhaustible
a) Renewable b) Fossil fuel c) Non Renewable d) Mineral
37. Earth day is held every year on
a) April 22nd b) 5th June c) November 23rd d) January 26th
38. Oil and gas are preferred because of
a) Easy transportation b) Cheap c) Strong smell d) All of these
39. Mining means
a) To conserve and preserve minerals
b) To check pollution due to mineral resources
c) To extract minerals and ores
d) None of these
40. What would you do to prevent environmental damage
a) Plant trees
b) Halt deforestation
c) Control pollution
d) All of the above
41. Effect of modern agriculture on soil is due to
a) Erosion b) Acidification c) Salinization d) All
42. Bio – remediation means removal of containments from
a) Soil b) Wastewater c) Ground water d) All
43. Population explosion will cause
a) Bio diversity
b) Stress in ecosystem
c) Unemployment
d) None of these
44. Smog is combination of
a) Smoke and Snow b) Snow and Fog
c) Smoke and Fog d) All the above
45. Physical pollution of water is due to
a) pH b) Chloride c) Turbidity d) All of these
46. Renewable energy is
a) Primary source b) Secondary source
c) Tertiary source d) none of the above
47. Generation of wind energy is mainly based on
a) Storm b) Pressure
c) Velocity of wind d) Direction of wind
48. Which of the following is not a green house gas?
a) Ozone b) Water vapour c) CO₂ d) Sulpher dioxide
49. World ozone day is being celebrated on every year
a) Sept 5th b) Sept 16th c) Oct 15th d) June 5th

50. First International earth summit was held at
a) Germany b) Stock Holm c) Riode Janeiro d) England
51. Environmental protection is a fundamental duty of the citizen of India under the
a) 21 b) 47 c) 48-A d) Article 51-A(9)
52. Important sources of land pollution are
a) Industrial waste b) Agricultural waste
c) Both (a) and (b) d) None of the above
53. The radiations absorbed by ozone layer are
a) Ultra violet b) Infra red c) Gamma rays d) Visible
54. The first major environmental Protection Law promulgated in India was
a) Air Act b) Water Act
c) Environmental Act d) None of these
55. Which of the following is the authority to monitor state industrial effluents?
a) State pollution control board
b) Indian environmental association
c) Centre for science and development
d) None of these
56. What is the permissible range of pH for drinking water as per Indian standards
a) 6 to 9 b) 6.5 to 7.5 c) 6 to 8 d) 6.5 to 8.5
57. What is the maximum allowable concentration of fluorides in drinking water
a) 1.0 mg/l b) 1.25 mg/l c) 1.5 mg/l d) 1.75 mg/l
58. Which of the following is a non point source of water pollution
a) Factories b) Sewage treatment plants
c) urban and suburban lands d) All of the above
59. Nitrogen fixing bacteria exists in – of plants
a) Leaf b) Roots c) Stem d) Flower
60. Forest rich area in Karnataka in found in _____
a) Western Ghats b) Kodagu c) Mangalore d) Belagavi
61. Cholera and typhoid are caused by
a) Worms b) Virus c) Bacteria d) Fungus
62. Hepatitis is caused by
a) Protozoa b) Virus c) Fungus d) Bacteria
63. The required iron content in drinking water as specified by BIS is
a) 300 mg/l b) 30 mg/l c) 3 mg/l d) 0.3 mg/l
64. The pH value of the acid rain water is less than
a) 3.2 b) 5.7 c) 7.0 d) 8.7
65. Reduction of brightness of famous Taj Mahal is due to
a) Global warming b) Air pollution c) Ozone depletion d) Afforestation

- 66 Ozone layer thickness is measured in
a) PPM b) PPB c) Decibles d) Dobson unit
- 67 Ferons are
a) HFC b) CFC c) NFC d) Hydrocarbon
- 68 Bhopal gas tragedy caused due to leakage of
a) Methyl iso cyanate (MIC)
b) Sulphur dioxide
c) Mustard gas
d) Chlorine gas
- 69 ICDS is a welfare scheme for
a) Public b) Women c) Men d) Children
- 70 Study of trends in human population growth and prediction of future growth is called
a) Demography b) Biography c) Kalography d) Psychology
- 71 Biochemical oxygen demand measures
a) Industrial pollution
b) Air pollution
c) Polluting capacity of effluents
d) Dissolved O₂ needed by microbes to decompose organic wastes
- 72 Increasing skin cancer and high mutation rate are the result of
a) Ozone depletion b) Acid rain c) CO₂ pollution d) CO pollution
- 73 Sound become hazardous noise pollution at decibels
a) Above 30 b) Above 80 c) Above 100 d) Above 120
- 74 The zero population growth due to equal birth and death rates is called
a) Natural increase b) Demographic transition
c) Fertility rate d) Replacement level
- 75 Cauvery water dispute is in between
a) Karnataka and Andra Pradesh b) Karnataka and Maharashtra
c) Karnataka and Tamil Nadu d) None of these
- 76 Khetri (Rajasthan) is famous for
a) Gold mine b) Copper mine c) Granite stone d) Marble stone
- 77 The Water (Prevention and control of pollution) Act was enacted in the year
a) 1986 b) 1974 c) 1994 d) 1984
- 78 The Forest (conservation) Act was enacted in the year
a) 1986 b) 1974 c) 1980 d) 1972
- 79 Environmental protection is the responsibility of
a) Govt. of India b) NGOs c) Individual d) All
- 80 Which of the following is NGO
a) Narmada Bachao Andolan b) Pollution control board
c) Gove. Conservation board d) None of these

- 81 The leader of Chipko movement is
a) Sunderlal Bahuguna b) Medha Patkar c) Vandana Shiva d) Anna Hazare
- 82 The Tiger conservation project was started in
a) 1973 b) 1984 c) 1999 d) 2004
- 83 An international conference on environmental education was held in December 1982 at
a) Kyoto b) Vienna c) New Delhi d) Rome
- 84 ISO 14000 standards deals with
a) Population management b) Risk management
c) Environmental management d) None of the above
- 85 The First International Earth Summit was held at
a) Johannesburg b) Rio de Janeiro c) Kyoto d) Stock holm
- 86 Disease caused by eating fish inhabiting mercury contaminated water is
a) Bright's disease b) Minimata disease
c) Hashimoto disease d) Osteosclerosis
- 87 Nitrogen oxide and hydrocarbons released by automobiles interact to form
a) Carbon monoxide b) Ammonia c) PAN d) Aerosols
- 88 The world AIDS day is recalled on
a) 1st July b) 5th June c) 1st December d) 5th October
- 89 ENVIS Means
a) Environmental Information System
b) Environmental Interference service
c) Environmental Information Service
d) None of the above
- 90 Corona viruses is a
a) DNA viruses b) RNA viruses
c) Chromosomal viruses d) None of the above
- 91 Where did the first case of corona virus dieses originate
a) Yamen city b) Wuhan city c) Whattman city d) Wang city
- 92 SARS refer to
a) Severe acute respiratory syndrome
b) Self acute respiratory system
c) Severe acute respiratory system
d) Self accurate rest syndrome
- 93 Effect of carbon monoxide on blood, causing
a) H_2CO_3 b) $COHb$ c) CO_2Hb d) $HbCO_2$
- 94 Which of the following is the most stable ecosystem
a) Mountain b) Desert c) Forest d) Ocean
- 95 In aquatic ecosystem phytoplankton can be considered as a
a) Consumer b) Producer
c) Saprotropic organisms d) Macro consumer

- 96 A primary succession on bare rock starts with
a) Lichens b) Herbs c) Trees d) Animals
- 97 Which one is matching sanctuary
a) Kaziranga – musk deer b) Gir -Lion
c) N.E. Himalayan region – Samber d) Sunderban – rhino
- 98 Which group of vertebrates comprises the highest number of endangered species
a) Birds b) Mammals c) Fishes d) Reptiles
- 99 In our country the percentage of land under forest is about
a) 20% b) 19% c) 25% d) 30%
- 100 Fluoride pollution mainly affects
a) Kidney b) Brain c) Heart d) Teeth

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